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COROT—DESERONTO



COROT, kô-rô', Jean Baptiste Camille, French painter: b. Paris, July 17, 1796; d. there, Feb. 22, 1875. Against the wishes of his family he studied art, first under Claude Michallon, next under Victor Bertin, and then in 1825 went to Italy, where he returned on two other occasions, in 1835 and 1843. In 1827 he first exhibited in the Salon in Paris, not gaining his great popularity, however, until 20 years later. The last 25 years of his life were spent in affluent circumstances (his professional income being immense, and his father's death having brought him a large fortune) and in the happiness engendered by success. In 1867 he was made an officer in the Legion of Honor.

One of the painters of the so-called Barbizon School, Corot excelled in landscape painting. He was a diligent student of nature, whose aspect he idealized on canvas in sober tints of brown, pale green, and silver grays. After 1850 his classical treatment of nature changed to a more "atmospheric" treatment, and he became pre-eminently successful with his scenes in the faint lights of dawn and twilight, behind a transparent veil of mist, the early rays glinting through the dense foliage, mirrored in sparkling water. His aim in this style is expressed by his words: "In our search for truth and exactitude of form let us never forget to give it that atmospheric envelopment that impresses us." Examples of his earlier work are *Narni Bridge* (1827, Louvre) and *Chartres Cathedral* (1830, Louvre), while his later style is represented by such paintings as *Dance of the Nymphs* (1851, Louvre) and *Recollection of Montfontaine* (1864, Louvre). He is also noted for his figure paintings, highly regarded of which are *La Zingara* (1865, Louvre) and *Woman with the Pearl* (1868, Louvre).

Among his other works may be mentioned *Martyrdom of Saint Sebastian* (1853); *Morning* (1855); *Evening* (1855); *Sunset* (1857); *Orpheus* (1861); *Rest* (1861); *Solitude* (1866); *Landscape with Figures* (1870); and *Pleasures of Evening*. Several of his works are in public and private galleries of America.

Consult Robaut, Alfred, *L'Oeuvre de Corot, catalogue raisonné et illustré, précédé de l'histoire de Corot et ses oeuvres par Etienne Moreau-Nélaton* (Paris 1905).

COROZAL, kô-rô-säl', town and municipality, Puerto Rico, in the north central part of the island, about 16 miles directly southwest of San Juan. It is a tobacco and fruit growing area and its chief industries are fruit and vegetable can-

ning. Deposits of gold, platinum, manganese, and copper are located nearby. Pop. (1950): town, 2,432; municipality, 23,080.

COROZO NUT. See **VEGETABLE IVORY**.

CORPORAL, in the army, a noncommissioned officer with rank under that of a sergeant. He has charge of small bodies of men, usually squads. In the British army there are also soldiers distinguished by the designation of lance corporal, who are privates acting as corporals but receiving only privates' pay. In the British household cavalry the sergeants are called corporals of horse and the sergeants major, corporals major. This is a survival of the organization of the 16th and 17th century cavalry.

In the United States army a corporal is the lowest noncommissioned officer. His especial duty is to place and relieve sentinels. The corporal wears two chevrons on his sleeve as a mark of his rank, the lance corporal one only.

A ship's corporal was an officer who had the charge of setting and relieving the watches and sentries and who later became identified with the master-at-arms.

CORPORAL, the linen cloth laid on the altar, on which the sacred vessels are set during the consecration of the elements of bread and wine in the Mass or Holy Communion. It is to be distinguished from the veil, which is used to cover the chalice and paten, and the palla or pall. Both corporal and palla must be blessed and when not in use are carried in the burse, a square pocket of cardboard covered with silk; none except those in holy orders being allowed to touch them when they are in use.

CORPORAL, The Little. A term of affection applied to Napoleon Bonaparte by the soldiers of his Grande Armée, who always remembered that he began his career as a *sous-lieutenant* in Corsica.

CORPORAL PUNISHMENT, punishment applied to the body of the offender. In its connection with civil government it technically includes flogging, imprisonment and the death penalty, but in common parlance its meaning is more restricted and refers only to flogging or whipping of the body. Various extreme and cruel methods of punishment once in vogue have been discontinued in Christian nations, but

needy and to enrich and ennoble humanity which is not to a great extent done through the instrumentality of corporations."

In 1922 nearly one-third of all the wealth in the United States was controlled by corporations. The Federal Trade Commission concluded that the total wealth in that year was fully \$353,000,000,000 and placed the wealth controlled by corporations at \$102,000,000,000. Seager and Gulick in 'Trust and Corporation Problems' made the statement in 1929: "Allowing for the rapid progress of the incorporation movement since 1922, we believe that no exaggeration is involved in the statement that more than four-fifths of American business enterprise is now carried on by corporations. The advantages which American business corporations enjoy are: (1) Autonomy, which includes the right to sue or to be sued in the corporate name, the right to own and control property and the right to enter into legally binding contracts; (2) Continuity of existence going to the point, under the laws of twenty-three of the states, including Delaware, of perpetual life; (3) Limited liability of shareholders; (4) Flexibility of management; (5) Easy transfer of shares of stock and through them of ownership and control; (6) Elasticity of capital; (7) Release of shareholders and other beneficiaries from the responsibilities of management. To these the liberalization of corporation laws has added in many states: (8) Moderate fees for incorporation; (9) All-embracing or blanket charters under which almost any conceivable development of the original corporate purpose becomes possible; (10) Opportunity afforded ambitious business men to command the capital of minority investors without surrendering control over the business."

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HORACE L. WILGUS,

Professor of Law, University of Michigan.

CORPORATIONS, Legal. Characteristics. In general the legal status of a cor-

poration is that of a *person*, with a name in which to do business, own or convey property, sue and be sued. It is normally managed by a board of trustees or directors, and officers, such as president, secretary, treasurer, etc. Its powers are those given at its creation. Its existence continues notwithstanding the death, withdrawal or insolvency of its members, or the transfer of shares, if it has a capital stock divided into shares. Its rights and obligations are its own, and not those of its members. Its creditors must look to it and to its property alone for payment, and not to its members, unless they have not paid for shares, or have wrongfully appropriated its property.

Classes.—Corporations are: *Aggregate*, created with a capacity to have more than one member at a time; or *Sole*, with capacity to have only one member at a time. Reduction to one member does not make an aggregate a sole corporation. Either may be: *Ecclesiastical* composed of ecclesiastical persons, for ecclesiastical purposes, and subject to ecclesiastical jurisdiction; or *Lay*, for temporal purposes, as "maior or communaltie, baylives and burgesses," and other business, social and literary purposes. In the United States, where there is no established church, church organizations, when incorporated, are *Religious Corporations*, and really *lay* corporations to manage the church business, without, and subject to no, ecclesiastical jurisdiction, except under the agreement of membership. Lay corporations are *Eleemosynary* (or charitable)—for the distribution of the alms of the donor or founder, as in the case of hospitals, colleges, etc.; and *Civil*,—for other purposes.

Civil corporations are: *Public*,—for governmental purposes, as the State, municipal corporations, etc.; *Quasi-public* (more properly, Public Service corporations),—for private gain but also to perform some public function as railroad, telegraph, etc., companies; and *Private*,—for advancing the interests of individuals in their private capacities. They are "not-for-profit,"—i.e., for the benefit of other than the members, as colleges, etc.; and for "profit,"—either pecuniary or otherwise. These are *non-stock*,—i.e., without capital stock and for some benefit other than pecuniary, as a literary society, or college fraternity; and *stock* (or moneyed),—for pecuniary profit by way of dividends on a *capital stock*. These classes are not mutually exclusive,—some corporations are within two or more of them.

In England, *lay* corporations are: *Trading* and *Non-trading*. They may be "chartered," by the king; or "Statutory," formed under acts of Parliament. These are usually called *companies*. The Non-trading are *Municipal*, for local government, or *Eleemosynary*, for charitable and benevolent purposes. Companies under the Companies Acts may be *limited by shares*, *limited by guarantee* and *unlimited*, according to the liability of the members. Other associations, resembling corporations, but without full corporate powers, or a "personal status," separate from the members exist both in England and the United States. They are: *public*, as counties, townships, parishes, school districts, etc.; territorial units for governmental purposes, or institutions, such as asylums, penitentiaries, State universities, etc., controlled by boards, with quasi-corporate powers; or *private*, such

CORPORATIONS, LEGAL

as miners' federations, labor unions, etc., stock exchanges, boards of trade, partnerships, syndicates, cost-book mining companies, joint-stock companies, trusts and partnership associations limited.

Joint stock companies are similar to corporations, but unless excluded by contract or statute, there is an unlimited individual liability of the members for the acts of the managers. The capital stock is usually divided into transferable shares, represented by certificates, and an owner is not an agent of the company unless he is so appointed. Recently "Trusts" have been organized for business purposes, with the legal title and power of managing the property vested in trustees, subject to the trust deed, the beneficial interest being represented by transferable trust certificates. In the absence of notice and agreement to the contrary the trustee is liable to third parties as an owner, and to the beneficiary for breach of trust. Partnership Associations, Limited, are created under statutes of Pennsylvania, Ohio, Michigan, etc., with powers very like corporations, with a capital stock, transferable shares and limited liability of members; the property is held and conveyed, and suits, by or against, are in the association name; they are not corporations for suits in the Federal courts, as a citizen of the creating State, without alleging and proving that no member is a co-citizen of the other party. The New York joint stock companies and some of the English insurance companies are similar.

Continental Systems.—Corporations are "Juristic Persons" in the Continental law, following the Roman. However, associations similar to those noted above exist. They are provided for in the Civil and Commercial codes. The general term is "Associations" (*Societas, Genossenschaft*), which includes both. Juristic persons are *Public*, as the state itself (*Fiscus*); *Charitable* (*Stiftung* or *Foundation*), the property, rather than its owners or managers, being personified. There are *Trading*, or *Non-trading* partnerships, syndicates, joint adventures, for profit, and associations for a common enterprise not for profit. The members are co-owners, but not partners. The *Trading* or *Mercantile* (provided for in the Commercial codes) are: *Société en nom Collectif* (*offene Handelsgesellschaft*), equivalent to our general partnership, but considered a juristic person in the Italian and Japanese law, so that death or withdrawal of a member does not dissolve, as it does in English, French or German law. *Société en Commandite* (*Kommanditgesellschaft*), with members with limited, and others, usually the managers, with unlimited, liability, corresponding to the English and American special or limited partnerships. *Société Anonyme* (*Aktiengesellschaft*), or joint stock corporation with transferable shares, limited liability of members, and managed by directors elected by shareholders. *Société commandite par actions* (*Kommanditgesellschaft auf Aktien*), a combination partnership and corporation, with shares, shareholders with limited liability, and managing partners with unlimited liability.

Tests of Corporate Existence.—The line of demarcation between an incorporated and an unincorporated body is not sharply defined. There is no universally accepted mark of a "juristic person," which excludes associations

not such. The American courts have suggested these tests in the creating State: (1) There can be no valid corporation without legislative authority; (2) when the legislative intent is clear, that will control in the creating State; (3) when this is not clear, resort must be had to *powers conferred*, and which, in order to make a corporation, must merge and vest the rights and liabilities of the individuals into one distinct, artificial existence. The courts of other States, however, will come to their own conclusions, from the powers conferred, and will not be bound by the legislative or judicial declarations of the creating State.

Creation of Corporations.—Coke said the essentials are: Lawful authority; persons to be incorporated; name; place; apt words. *Lawful authority* may be either by common law; act of Parliament; king's charter; prescription; to which may be added, implication and consolidation. By the common law, kings, bishops, parsons, vicars, deans, governors and officers generally are held to be corporations sole, "by the universal assent of the people from remote ages," and from necessity in order that they may carry out their official functions. For the same reason, the English "Parliament," the "United States" and the separate States, are held to be corporations aggregate, but the "British Empire," the "United Kingdom" and the "Church of England," are not. The king is the state. Australia, however, is considered a corporation sole. By legislative act—in 1523 Parliament incorporated the "Colledge of Physicians," and the king "in Parliament" has always claimed the power to erect corporations, as well as "without" Parliament. Like power inheres in the United States Congress, and in the State legislature, without express constitutional provision, and may be exercised by *special* or *general* act, if constitutions do not forbid. The colonial and State legislatures, in our early history, acted by *special* acts only. The Roman legislature acted either way. In 1597 a general law was passed for the incorporation of hospitals in England, and from 1844 to the present, various "Companies Acts" have been passed for the incorporation of companies by simple acts of registration. Public service corporations are usually provided for by special acts, embodying however various "general clauses," and monopoly or eminent-domain power, for jurisdiction contrary to the common law can be conferred only by Parliament, if to be exercised within the United Kingdom. On the continent, corporations are formed under the general provisions of the civil and commercial codes, but the legislatures of the several States may act otherwise. In 1778 Protestant churches were allowed freely to incorporate in South Carolina. In 1784 churches were incorporated in New York under general laws; in Delaware in 1787; in Pennsylvania in 1791; canal companies in North Carolina in 1795. In 1808 Massachusetts regulated manufacturing companies by general law, and in 1811 New York by general law, provided for their incorporation. In 1838 the Florida constitution directed the legislature to "pass a general law for the incorporation of all churches," and forbade their creation by special act. In 1845 Louisiana made a similar provision for all corporations "except for political or municipal purposes." New York (1846) made similar provisions, while

Ohio (1851) said "The general assembly shall pass no special act conferring corporate powers. Corporations may be formed under general laws; but all such laws may from time to time be altered or repealed." One or the other of these provisions now exists in nearly all the State constitutions, put there to secure equality of privilege, uniformity of powers and to prevent fraud, corruption and loss of time, incident to special legislation. There is no such limitation in the Federal Constitution, so Congress may act either by special or general act. In the manufacturing act of 1808, Massachusetts reserved the right to amend or repeal it. After the decision of the Dartmouth College Case in 1819, holding that an accepted corporate charter constituted a contract, the obligation of which could not be impaired by subsequent State legislation, State constitutions and incorporation laws usually provide that corporation charters shall be subject to repeal or amendment. The inhibition in the United States Constitution, against impairing the obligation of contracts, is on the States only. The United States government is one of express powers, and such as are necessarily implied therefrom, and so Congress (except in the Territories and District of Columbia, where it has a general legislative power), can create corporations only to carry out some of these express or implied powers. King's charter—"Anciently, a gild, either religious or secular could not legally be set up without the King's license," and in 1179 many "adulterine gilds" were amerced by Henry II. Bracton (c. 1260) said it was the exclusive prerogative of the king to grant franchises. However, as late as 1523, the Pope incorporated religious bodies in England. The bishops of Durham (a county Palatine) claiming *jura regalia* from the Conquest, incorporated the "Barkers and Tanners" at Gateshead, and granted charters to the city in 1565, 1602 and 1780. In 1376 it was held that only by the king could new corporations be created, though he could license another, as the chancellor of Oxford University, to create corporations to operate in Oxford. The Tudor sovereigns incorporated many "rotten boroughs," for political reasons. Henry VII granted charters to John and Sebastian Cabot in 1496, 1498 and from then to Victoria many great trading and colonizing companies have been incorporated by the English sovereigns.

In the United States, in colonial times, the king chartered corporations, e.g., William and Mary College (1693). Governor Andros of New York (1675, fisheries), William Penn (1682, trading), and Lord Baltimore, exercised such authority, but since the American Revolution the power is vested exclusively in the legislature, and not in the chief executive. Prescription—A body which has claimed and exercised unquestioned, corporate powers so long as to raise a presumption that a charter existed, but lost by the lapse and accidents of time, is said to exist by prescription, which is sufficient until the contrary is proved. Implication—Coke says "of ancient times the inhabitants or burgesses of a ville or burg were incorporated when the king granted to them to have a merchant gild." The king's charter to the "men of Dale and their successors," or an act of Parliament granting an estate in fee to the "Conservators of the river Tone, and their

successors" made them a corporation. Consolidation—this is now only by express legislative authority whereby two or more corporations unite to form a third, although in 1377 it was said one corporation could be so united to another as to succeed to its rights.

Persons to be incorporated—Coke says these may be either natural or artificial, but where the statute says "Three or more persons may incorporate," natural persons only are meant; however, in most of the States statutes authorize the consolidation, merger or amalgamation of two or more corporations into another, or the holding of shares in another. Sometimes incorporators are required to be citizens or inhabitants of the State, but not usually. A person incapable of contracting probably cannot be an incorporator, but incompetent persons may succeed to the ownership of shares. In the Roman and Continental law, a "bunch of property,"—a "foundation," or an "inheritance" might be incorporated, but in the English and American law it seems persons only can be incorporated, although possibly an "image of an Indian God" may be, under the English law. Persons become members only by consent, in complying with the charter and by-laws, in non-stock corporations; but by the ownership of shares in stock corporations, either by original subscription, purchase from a former owner, or by operation of law. Subscriptions may be either (1) to commissioners appointed to open books for that purpose; (2) in the incorporation paper, under general laws; (3) on a preliminary subscription paper; (4) agreement with a promoter; (5) contract with the corporation after it is formed; (6) underwriting; (7) application, allotment and notice. (1) and (2) are statutory and effective at once by force of the statute if it is followed. In (3) the corporation is not yet in existence, and if the paper reads: "We the undersigned hereby subscribe the shares set opposite our names," there are four theories in the American courts: (a) A mere offer to the future corporation, revocable by withdrawal, death or insolvency, any time before the corporation comes into existence and accepts; (b) A binding contract as soon as all the stock agreed upon is subscribed, the mutual subscriptions being considerations for one another, and since the group of subscribers is the same after, as before, incorporation, they then can enforce it in the corporation name. This accords with the intention and purpose of the parties. Only a few courts so hold however, the majority following rule (a); (c) Only an offer to the future corporation, but a contract among the subscribers, as soon as the subscription is complete. This recognizes the right of revocation as to the corporation, but not as to the subscribers. The result is not clear; (d) A binding agreement if, before incorporation, the subscribers have relied on the subscriptions to pay for property for the future corporation, and they cannot be placed in statu quo. (4) Subscriptions to promoters, before incorporation, are generally held to be enforceable by the corporation, when it comes into existence against either the subscriber, or the trustee; In (5) there is no difficulty about parties or consideration, and the subscription may be either oral or in writing; (6) An underwriter agrees to take the stock not subscribed by the public, for a commission, or at a discount from the price

to the public. The purpose is to guarantee the taking of the stock within a specified time; (7) Application, allotment and notice is the English method, where application is made to the promoters, who allot part or all the shares applied for, the contract being completed when the notice of allotment is dispatched. The effect of a completed subscription contract is to make the subscriber a member, whether or not he has paid, received a certificate or been registered as owner. He impliedly agrees to pay, upon call, the amount stated.

Name.—The early authorities said a name is of the very essence of the corporate institution, the knot of their combination without which corporate acts could not be performed. It is usually given by charter, but may be acquired by user. General laws require the name to be stated in the incorporation paper, and it must not be the same as another in the same jurisdiction. It may be protected as a trade mark, and its unfair use may be enjoined. A change of name does not change the identity of the corporation.

Place.—An old authority says: "There must be a place certain where to fix and bottom the corporation," for "without a place no incorporation can be made." General laws require the location of the "principal office," or "place of business" to be stated in the incorporation paper. Places within and without the incorporating state may be stated.

Proper words.—"But not restrained to any certain and legal and prescript form of words." Any, indicating an intention to incorporate, as "incorporate," "found," "erect," "create," "form," or others, will do.

Incorporation.—Acceptance of all (not part of) the terms offered by the lawful authority by the persons to whom made is essential. Promoters usually have the papers prepared, and secure the acceptance by the persons to be incorporated; they stand in a fiduciary relation both toward such persons, and the corporation, if formed, and are liable for unfair dealing, to both. In a special act, or a charter from the king, the terms, conditions and forms of organization are set forth, and may be accepted formally by resolution, or informally by acting under them. A contract then results between the corporation and the state, constitutionally exempt from subsequent amendment or repeal, unless such right is reserved.

Charter.—The document containing the grants is called the charter. If a special act, after acceptance it is not only a contract, but also a law of that state, which every citizen thereof is bound to know. When the act is general, then the details of any proposed corporation must be set out in an "Incorporation Paper" (usually prepared by the promoters), often called Certificate of Incorporation, Articles of Association, Memorandum of Association, etc. The general law usually requires the purposes, name, place, capital stock, amount subscribed, number of shares, names of incorporators or subscribers, to be stated in this incorporation paper, which must be signed, and acknowledged in a specified way by a certain number of incorporators, and then filed, recorded or registered in designated public offices. Other provisions as to organization, powers, voting, meetings, transfers of shares, reports, amendments, dissolution and winding up are

usually found in the general laws. These and the incorporation paper, executed as required, become the charter, and have the effect both of a law and a contract, as under a special act.

Compliance with Conditions.—Substantial compliance with the conditions precedent of the general law makes a *de jure* corporation, i.e., one invulnerable against the direct attack by the State. What are conditions precedent and what conditions subsequent are difficult to determine. Are the things to be done by the incorporators, or by the corporation? If the former, they are conditions precedent; if the latter, subsequent. In most States, a certain number of incorporators, written articles stating everything specified, executed in the precise way indicated, and filed as directed, are conditions precedent to *de jure* corporate existence.

De Facto Corporations.—In the United States, failure in some of these particulars does not make the effort abortive entirely. A good faith effort to organize under a valid law, colorable compliance therewith and corporate user,—although some condition has not been complied with,—results in a corporation *de facto*, valid as to all the world except the state in a direct attack for non-compliance with such condition. In a majority of the States it acquires a corporate status, and the members escape individual liability, as in a *de jure* corporation. Some deny this, in eminent domain proceedings by it, or to enforce preliminary subscriptions, or in suits against the members by persons not estopped by dealing with it as a corporation. *De facto* existence is not recognized in England or on the Continent.

Some courts go further and say that whenever a group of persons hold themselves out as a corporation, and thereby induce others to deal with them as such, it and they are estopped to deny the corporate existence, if it would be inequitable to do so. Some say estoppel arises only on matter of fact and not of law; others that there is estoppel only when there is *de facto* existence; and others deny the doctrine entirely.

Commencement of Corporate Existence.—Some statutes read "upon filing the incorporation paper the corporation shall be deemed to be in existence," before stock is subscribed or organization effected. They require the incorporators *after* filing the incorporation paper to take subscriptions, and when the requisite amount is subscribed to call a meeting of the subscribers to organize. Only an inchoate existence seems possible until there are stockholders and organization. The weight of authority so holds, but there is authority to the contrary.

Where to Incorporate.—Arizona, Delaware, District of Columbia, Maine, New Jersey (formerly), Porto Rico, South Dakota and West Virginia have more liberal incorporation laws, and lower fees, than many other States. Business men dislike divulging business secrets, making reports and being hampered in their operations, and so prefer incorporating in the "liberal States." To answer "where," various matters are to be considered, requiring careful attention and comparison by a competent attorney.

Corporate Rights.—"By incorporation it acquires *jus personæ*, and is capable of all civil rights of having and doing." So run the old authorities, and so was the Roman law. "No

freeman ought to be disseized," "No person shall be deprived of life, liberty or property," and "No State shall deny to any person the equal protection of the law," all include corporations; and generally the word person in statutes includes corporations, if the subject matter permits.

Of course a corporation has no body to be assaulted, beaten, imprisoned, hung or electrocuted, although old cases discussed the situation when it lost its head by the death or imprisonment of the dean of a chapter. It cannot "eat, drink or be merry," marry, have children, heirs, brothers or sisters, although "to-morrow it may die." It has no sex, race or color, but whether it is *it* or *they* has been discussed. It may have a good will, good or bad reputation and be slandered, libeled or maliciously prosecuted. It may be a "respectable and responsible person," but not a "colored person," or a "rogue or vagabond." In England and Germany it may be an alien enemy if incorporated, domiciled or controlled by agents, in the hostile state. The inferior courts of the United States have held otherwise if only incorporated in the hostile state.

In the United States a corporation is a citizen of the incorporating State, regardless of the citizenship, domicile or residence of its members, for suits in the Federal courts, and an inhabitant of the district in which it has its principal place of business. It can do business and have agents in other States, and sue and be sued there.

On the other hand, it is not a citizen of the incorporating State, within the meaning of the clause "the citizens of each State shall be entitled to all the privileges and immunities of citizens in the several States." Nor can it, nor its officers for it, refuse to produce its books and papers in evidence, because they would incriminate it. It has, however, whatever other rights are given it by its charter. And in general, a corporation has the same rights to sue either at law or in equity to protect or vindicate its rights as a natural person has.

Corporate Liabilities.—Corporations are subject to the general duties and obligations imposed upon other persons by the law, and are liable for breaches thereof. In the Roman law, Ulpian (*ad edictum*, 198-217 A.D.) said: "just as the praetor allowed an action on behalf of a municipality, he thought the edict should allow actions against one."

Torts.—Corporations are now held liable for torts both in England and America. Such liability was of slow growth due to the "artificial personality" theory, current in the Middle Ages. In 1234 Gregory IX authorized the excommunication of ecclesiastical corporations, but in 1245 Innocent IV forbade such "as the *innocent* may . . . be caught by a sentence of this kind." In 1348, in England, "The corporation is invisible, incorporeal, . . . Trespass does not lie against it, for *capias* nor *exigent*, lies not against a commonality," and in 1356 "Nor can they commit treason, or be outlawed or excommunicated, for they have no souls." This was frequently repeated (Coke 1600; Blackstone 1765) until down into the 19th century and corporations were thought not to be liable for torts or crimes of misfeasance. However, they were held in England for forcible disseizin (1357), and trespass (1371, 1430,

1454); negligence (Massachusetts 1810); conversion (England 1812); nuisance (Pennsylvania 1818); trespass to land (Delaware 1839); assault and battery (Florida 1842); deceit (Ohio 1846); false imprisonment (England 1851); malicious prosecution (Connecticut 1853); but denied in England until 1890 or 1904; libel (England and United States 1858); but only since 1880 for slander; exemplary damages (Illinois 1858); and tort in an *ultra vires* transaction (United States 1858).

Crimes.—Corporations were punished very early for delinquencies. The liberties of London were seized in 1245, for a false judgment by its magistrates, in 1264, for joining the barons against the king, in 1284, because the mayor, being bribed, connived at the bakers making their penny loaves six ounces too light, and many others, to the *quo warranto* in 1683, for extortion in tolls and the publication of a seditious libel. In 1811 a corporation was indicted for not repairing a bridge in England, and in 1812 in Massachusetts; in 1846, in England for disobeying a court's order, and obstructing a highway, followed by New Jersey in 1852; in 1876 for criminal libel in Missouri; in 1879 for Sabbath-breaking in West Virginia; in 1892 for keeping a disorderly house in New Jersey; in 1900 for criminal negligence, in not maintaining a bridge, causing death and equivalent to manslaughter by Canada Supreme Court. The United States courts refuse to go so far. Corporations, however, are generally held criminally liable for violations of pure food, anti-rebate, anti-trust and revenue laws, as well as for public nuisances. They are not yet held liable for higher felonies,—the requisite criminal intent supposed to be impossible and the punishments provided inapplicable.

Powers.—In England corporations chartered by the king have a *general capacity* to do anything not forbidden, while one created by an act of Parliament has only a *special capacity* to do what is expressed,—"only that and nothing more." Yet both have the incidental power of succession, to contract, grant, sue in its name, purchase property, have a seal and make by-laws. The doctrine of special capacities has obtained in the United States from the beginning, and for all corporations. This has led to the doctrine of *ultra vires*, beginning in 1804 in the United States, and in 1846 in England, based on four principles: (1) a corporation has no powers except those granted by its charter; (2) whoever deals with it must know these; (3) stockholders should not be subjected to risks not contemplated; and (4) the state is interested that the powers shall not be exceeded. An entirely executed contract will not be disturbed at the suit of either party; so, too, a wholly executory contract will not be enforced, or damages allowed for its breach by either party. In England, in many States, and by the Federal courts, an *ultra vires* act is legally void, because of incapacity of the corporation; in many other States, void because illegal as against public policy; but in New York and others valid and enforceable whenever it would be inequitable not to do so. When such contract is executed by one party but not by the other, the decisions divide: those holding it is void will allow no suit on the contract, but permit recovery in quasi contract or tort for benefits conferred if unjust to refuse; while

the New York courts would then permit recovery on the contract. If the public is injuriously affected by the *ultra vires* act, the State may dissolve the corporation in *quo warranto* proceedings. In the United States a business corporation may borrow money and give a note, secured by mortgage upon its property. In England the power is not so broad. There is no implied power to form a partnership, or become a guarantor or surety, for the accommodation of another. It may acquire its own shares to secure payment of a debt not otherwise collectible, but not for speculative purposes, to discriminate among its own shareholders, or defraud creditors. A corporation may acquire the shares of other corporations, but not for the purpose of controlling them. Investment, insurance and charitable corporations in some cases are held to have an implied power to invest in the shares of other companies. Many States by statute permit one corporation to hold stock in another. A corporation may now act as trustee, although the old cases said it had no conscience to be coerced by the chancellor. Statutes now generally allow the incorporation of trust companies with power to act as guardians, executors or administrators.

Landholding.—At common law, a corporation could acquire land as an individual, but this deprived the feudal overlord of his feudal relief, wardship and marriage fees, for corporations did not die, or have children. So in 1217, a gift to a religious house "is to be utterly void and that land is to accrue to the lord of that fee," if he enters within a year, or the next higher lord within six months thereafter, and so on to the king. When the Franciscan friars came to England under a vow of absolute poverty, *dominion* was sinful. Their need of food and shelter was supplied by a benefactor conveying his property to another for their use (*ad oeps*), as Richard le Mulines did at Oxford in 1225. The clerics caught the idea, and *uses*, enforced by the chancellor, enabled the corporations practically to evade the mortmain acts of 1217 and 1279. *Uses* were devisable but legal estates were not. So in 1391, another mortmain act, extending to lay corporations as well as ecclesiastical, and including *uses* was passed. In 1535 the Statute of Uses carried the legal estate to the holder of the use and made it a legal estate. In 1541 the first statute of wills enabled a man to devise land to any one. This seemed to repeal the mortmain statutes, if the land was devised to a corporation, so in 1543 the wills act was amended allowing devises to any one, *except corporations*. Thereafter the mortmain laws which still exist in England prevent a corporation from taking or holding land either by deed or will, unless expressly authorized by its charter.

Mortmain statutes do not exist in the United States, and statutes of wills do not generally forbid devises to corporations. However, under the doctrine of special capacity, a corporation has power to acquire only such land as is reasonably necessary for its purposes. More is held *ultra vires*. What is the effect? Under the mortmain policy the overlord could escheat it to himself, but neither the grantor, his heirs, nor the grantee corporation could repudiate the executed grant. There is no overlord here—but the State may bring *quo warranto* proceed-

ings against the offending corporation for its *ultra vires* act,—yet the title remains in the corporation and the land continues assets of the dissolved corporation by the weight of authority. Some cases hold otherwise. A limitation in a statute of wills against devising has a different effect from a limitation in the corporate charter to take and hold land. A devise contrary to the statute is void, passes no title, the heirs inherit, and the corporation gets nothing. If there is no limit on the power to devise, but only in the corporation's power to take or hold, a devise to it will be good,—but the State may dissolve the corporation for taking or holding. Such is the weight of authority, but there are several decisions to the contrary. A corporation may take an estate in fee, for life, for years, or at will, in common, remainder or reversion, but not dower, curtesy or joint tenancy.

Corporate Funds.—All the title, legal and equitable, belongs to the corporation, and not to the members, in equity, or as tenants in common, and this is true if the membership is reduced to one person. He does not own and cannot replevin the property. A conveyance by persons of their own property to the corporation for all of its stock is a real conveyance subject to a stamp tax (if there is one), and afterward the property can be taxed to the corporation and the shares to their owners. A member has an equitable right to have the funds applied only to the corporate purposes. In business corporations, the funds are represented by a capital stock, divided into shares; the authority for this, or to increase or decrease the same, must come from the State. The amount is stated in the incorporation paper; it is raised by subscription, to be paid as called for; it is the basis of corporation credit. If the net property of the corporation exceeds this capital stock, there is a surplus; if less, a deficit. The market value of all the shares may be more or less than either the property or capital stock.

Shares are generally required to have a *par* value,—\$10 or \$100,—but in New York, Delaware and Maryland may, by statute, be created without *par* value. Shares may be created with a preference as to dividends at incorporation, but afterward only by unanimous consent or statutory authority. In the absence of statutory inhibition, shares may be issued at a discount, valid between the corporation and the subscriber, but not as against the creditor who has relied upon the *par* value of the outstanding stock; if he cannot get paid otherwise he may compel the balance of the *par* value to be paid. New York holds otherwise. Even if the statute says "all fictitious issue of stock is void," the subscription at a discount is not void, the subscriber becomes a shareholder,—but he can be compelled to pay the "discount" for the protection of innocent creditors. Stock may be issued for such property as the corporation needs at a fair valuation, determined by the directors, and if in good faith and with reasonable judgment it will not be disturbed; excessive over-valuation is evidence of fraud, unless satisfactorily explained; a court of equity may require, for the protection of creditors, the difference between the reasonable value and that at which it was taken to be made good. Stock may be issued for patents, trade-marks, copyrights, formulas, good will and services, if

reasonably valued, in most States, but not in all. New York allows the payment for construction work at the actual value of stock without reference to par value, and generally when a corporation is in failing circumstances, in a good faith effort to resuscitate it, shares may be issued as a bonus to "sweeten bonds" without liability to subsequent creditors.

In 26 States there are "blue sky laws" (q.v.), forbidding corporations or dealers to offer corporate securities,—stock or bonds,—for sale as a continuous transaction, without first reporting to and securing a license from the State securities commission. In many States similar provisions exist as to public service corporations, which are required to get authority from public service commissions.

Corporate Action.—Since a corporation is one person made up of other persons, an organization of some kind is necessary in order that "they" may manage "it,"—for it can act only through agents or organs provided in its constitution. These are duly assembled meetings of the members, or directors, officers, agents, servants,—the last two not being parts of the organization. To be valid, a meeting must be called by proper authority, notified as required, and attended by a quorum. These usually are regulated by by-laws. If not, notice must be personal,—and all notified. At common law, a quorum of members,—being a fluctuating body,—consists of those who come, though only one or two; but of directors,—being a fixed body,—a majority is required. These should be fixed by by-laws.

Voting may be by show of hands, polling, viva voce or ballot, and, at common law, was by persons and not by shares, although now, in stockholders' meeting, usually by shares; in directors' meeting not. A majority vote of the quorum controls. Voting by proxy is now usual among shareholders, but should be authorized by statute, charter or by-law provision. Directors cannot, unless expressly authorized, vote by proxy. Some States have authorized shareholders to cumulate their votes for directors.

Seal.—The old authorities said a corporation "acts and speaks only by its common seal." This was the "visible sign of the invisible body," by which its will was made known, and the only authentic evidence of it. Exceptions allowed were in trivial matters, as driving out trespassing cattle; doing what the corporation was appointed to do; buying and using goods. A seal according to Coke is "an impression on wax," and this "magic of the wafer" yet exists in England, except as to corporations under Companies Acts (1908), which may contract in writing, by parole and without a seal wherever an individual may do so. Such has been the general rule in the United States since 1813 and 1827.

Members.—Their rights are Collective—(1) to elect directors, and sometimes officers; (2) amend the charter; (3) control the issue, increase and decrease of stock; (4) make and amend by-laws; (5) investigate management; (6) check *ultra vires* acts; (7) admit members; (8) remove members or officers for just cause; (9) dissolve the corporation,—all to be done in duly notified meeting; and Individual—(1) to have notice of meetings; (2) vote; (3) inspect books; (4) enjoin changes in the enterprise; (5) sue in equity for corporate wrongs

on behalf of all, when directors wrongfully refuse; (6) have a certificate of stock, if any; (7) transfer same; (8) be registered as owner; participate in (9) profits, (10) issue of new stock and (11) in assets on dissolution.

Notice.—actual, necessary at common law must conform to statute, charter or by-law, and if meeting is special, must state the purpose. Rules, same for shareholders' and directors' meetings.

Voting.—at common law by *persons*, not by shares, unless authorized by statute, charter or by-law. Directors vote only as individuals, not by shares or proxy. Shareholders may vote by proxy, if statute, charter or by-law allows, and perhaps such right may now be implied from the usual custom. Proxies are revocable, unless coupled with an interest. Voting trusts among shareholders are allowed in some States, in others not. If a corporation has 20 members each having one share, 11 votes could control; if these 11 form a trust to cast their 11 votes as a unit, to be determined by a majority of the 11, i.e. 6,—then the corporation is, or may be, controlled by 6 votes, instead of a majority; which is contrary to public policy by one view, but not by the weight of authority if not for some illegal purpose. Some States by statute allow cumulative voting; that is, if a member has one vote for each of five directors, he may vote all five for one and no more, or three for one, and two for another, and possibly thereby secure representation on the board.

Inspect books.—at common law only when a controversy existed between shareholder and the corporation, or among shareholders. The right is now usually broader, based upon the idea of co-ownership, but is usually regulated by statute, charter or by-laws. *Enjoin ultra vires acts*, on the theory that a member has an equitable interest in having the corporate funds applied to the corporate purposes only, and there is no other adequate remedy.

Certificate.—not necessary, but the usual and convenient evidence of membership, and when the shareholder is entitled to, he can compel its issue, or treat refusal as a conversion and sue for damages. It is not negotiable and a bonafide purchaser does not take it discharged of previous equities, unless the owner is estopped.

Transfer.—usually by endorsement, and delivery of the certificate for the purpose of transferring title. After endorsement in blank, it will pass by delivery, but a thief, or one getting his title from the thief, cannot pass good title so as to divest the real owner, if he was not negligent some way. In England the transfer is usually by a separate instrument.

Registration.—by weight of American authority, is not necessary to give transferee title, both legal and equitable. Some hold only equitable title passes by delivery of certificate without registration, and a few that registration is necessary to pass any title. Usually registration is for the convenience of the corporation in keeping track of its membership, giving notices and paying dividends—and in the absence of notice, corporation is not liable for following the register in these particulars. The rightful owner may demand and compel registration, or sue for damages for refusal. Corporation may demand reasonable proof of shareholder's right. In England and on the Continent registration is

generally necessary to confer complete rights of membership.

Dividends.—are properly declared and paid only when there are profits or a surplus, but this may be from earnings or increase in value of property. Current obligations, interest and taxes should be paid first; sinking fund to meet outstanding funded securities when due, and depreciation, should be provided for, but are not legally required. When proper conditions exist, whether a dividend shall be declared and paid rests in the sound discretion of directors, and may be either *cash* or *stock*; if cash the money is paid out to shareholders; if stock the money is kept by the corporation, but the stock to an equal amount is issued to the shareholders, in which case there must be authority to increase the stock. A dividend is declared by resolution of directors, and when notified to shareholders, becomes irrevocable, and makes the shareholder a creditor of the corporation, for his part of the dividend, whether then due or not, and when the dividend fund is actually or constructively set aside, the shareholders then become not only creditors but the equitable owners of it. The owner of the stock at the time it is declared is the owner of the dividend, without reference to when the profits were earned, or time of payment, or name on the register, although the corporation will be protected if it pays the registered owner, without notice of the real owner. Of course the parties may stipulate as to who shall be entitled to the dividend, and when sold on the stock exchange its rules apply. Shares may have a preference in dividends if originally created as preferred and common. "Seven per cent. preferred" entitles the holder to receive 7 per cent before the common receives anything, but only out of profits; also, cumulative, i.e., to receive when profits are sufficient, what was unpaid up to 7 per cent for back years, although some courts hold this is not so unless expressly stated to be cumulative. By weight of authority, preferred shares are not entitled to participate in profits beyond their preference, but Pennsylvania holds that preference stock participates equally with the common after it has received the same as the preferred. Even if the preferred is guaranteed, it is entitled, not to interest, but to dividends out of profits only. Efforts to make preferred shareholders creditors, on equality with other creditors, in reference to the capital have failed,—and their stock is postponed to creditors' claims.

Participation.—proportionally, in issue of new stock, at its par value, whatever may be the market value, is a right incident to existing stock, of which the shareholder cannot be deprived without his consent. Participation in assets is considered below.

Directors.—Though elected by shareholders, or members, directors receive their authority from the State, and their judgment is not subject to control of members. They are clothed with the business powers only,—advisability of corporate action, selection of inferior officers and agents, application of funds, declaration and payment of dividends. These duties are fiduciary toward the corporation and shareholders and directors must act with reasonable skill and diligence,—that of any ordinarily prudent man in his own affairs according to some authorities—but being paid only in fees, ac-

cording to other authorities, only the ordinary care of a gratuitous bailee is required. To some extent they are general agents, mandatories and trustees, but, in good faith, by the weight of authority, they may deal with the corporation itself, though some authorities hold the corporations may object, if it acts promptly. Dealings between corporations having the same directors, or a majority of the same, are subject to similar rules. Slight evidence of unfairness or overreaching will enable the corporation to impeach the transaction.

Officers.—President, secretary, treasurer,—with the power incident to such officers in deliberative assemblies generally, and no others, without others are conferred expressly, or impliedly by "holding out,"—are customary. The secretary is usually made custodian of the corporate seal, and the president, general manager. For performing the official functions incident to their offices they are not entitled to pay, but for other service they are. There is no right of removal during term of office, by shareholders, unless statute, charter or by-law so provides. For gross misconduct, or fraud, a court of equity on proper application and showing may remove.

Creditors.—The corporation and its property only are liable to creditors; the members are not, unless they have not paid for their stock, or wrongfully received the corporate property, or by statute. The corporation has the same power, within its charter, to manage and control its property, without interference by creditors as would an individual, and as he may, so may the corporation, prefer creditors, by the weight of authority. Some States hold otherwise, and the present United States bankruptcy law now forbids preference made within four months of bankruptcy. Some permit the corporation to prefer its own officers as creditors, if there is no actual fraud. Perhaps the weight of authority is the other way however. Creditors of course may complain of the disposition of the corporate property for the purpose of defrauding them, and have all the ordinary rights at law and in equity, against the corporation, and its property, they would have against an individual, but in the case of a public service corporation its property cannot be taken on execution so as to prevent the performance of the public duties. Resort must then be had to the sequestration of earnings by receivership or otherwise.

It is often said that the corporate assets are a trust fund for the protection of creditors. Assets here include the corporate property, what is owing to it by others whether by members for unpaid stock or issued for over-valued property, or otherwise, or by others including claims for wrongs done to the corporation by the wrongful disposition or negligent dissipation of its funds. A receiver, in a court of equity, or a creditor by a creditor's bill, after an unsatisfied judgment against the corporation, can reach all the foregoing, so far as necessary to pay the creditors. This, however, is not a trust fund in the sense that the corporation has the legal, and the creditors have the equitable, title, before the court has taken possession of the property on behalf of creditors. Only such creditors as have relied upon the outstanding stock or property can complain. Creditors who become such *before* the unpaid stock was issued

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HORACE L. WILGUS,
Late Professor of Law, University of Michigan.

CORPORATIVE STATE, a system of government in which the population is grouped according to economic activity in more or less compulsory "corporations," syndicates, or guilds, which are represented in the government. First established in Fascist Italy, it has been an instrument of dictatorship, bringing economic activity under strict government control through the filling of key posts with faithful party members. In Italy in 1926, 13 syndicates were formed from employers and employees (separately) in agriculture, industry, commerce, banking, air and marine transport, and land transport and inland navigation; with one for arts and professions. They were consolidated in a National Council of Corporations in 1929 under a state minister. In 1934 their number was increased to 22, and their nominal political power was increased. In 1938 the Chamber of Deputies was abolished and replaced, as the lower house of the Italian Parliament, by the Chamber of Fasci and Corporations, consisting of 150 members of the National Council of the Fascist Party and 500 members of the National Council of Corporations.

Although the Italian corporative state was destroyed by World War II, variants of the system survived the war in Spain and Portugal. In the Spanish Parliament (the Cortes), as reorganized by Francisco Franco in 1942, roughly a third of the members are representatives of the national syndicates. In the Portuguese "New State" constituted in 1933 by Antonio de Oliveira Salazar, the Corporative Chamber sits concurrently with the National Assembly (Cortes Gerais) and has advisory powers.

CORPS, kôr, a body of persons, usually under common direction. The term may be applied to various divisions of troops; the *corps d'armée* is a military unit composed of from two to four divisions; the *corps de garde* is a body of men on guard, or the guardhouse.

In political usage, the term *corps législatif* was employed from 1857 to 1870 to designate the lower house of the French legislature. The *corps diplomatique* refers to a nation's entire body of diplomatic officials.

The word is also used in a less specialized sense as in *corps de ballet*, a ballet company. *Esprit de corps* is the spirit pervading a group of individuals dedicated to a common cause.

CORPSE, a dead body, in most common usage applied only to the human body. To the human corpse there can be no property rights, save in the rare case of disposition by regular will of one's body. Questions about disposition of a corpse are heard by an ecclesiastical court in England and by the civil courts in the United States and other countries where church and state are separate. Prior right to a dead body naturally goes to the nearest of kin, marriage ties ranking above those of blood. Burial expenses come under the general head of property rights in that they take precedence over any claims against deceased or his estate. Mutilation of the buried body, and body-snatching, are criminal offenses.

CORPULENCE is bodily bulk, particularly obesity (q.v.).

CORPUS CHRISTI, kôr'pûs krîs'tî, city, Texas; seat of Nueces County. It is situated

at an altitude of 40 feet on Corpus Christi Bay at the mouth of the Nueces River, 140 miles south of San Antonio, and is served by the Missouri Pacific, the Southern Pacific, and the Texas Mexican railways. The city has an airport with airline service; and steamship connections with gulf and ocean ports. The surrounding country produces cotton and oil. Corpus Christi has oil refineries, cotton gins and compresses, alkali plants, and a smelter, and produces cement, and corn and cellulose products. In volume of business handled, its port ranks third among the state's fourteen. The connection with the Gulf Intracoastal Waterway, serving more than 25 coastal cities, was completed in 1943. The city has a community center, city and county libraries, a county museum, hospitals, a naval air training station and several subsidiary fields.

The coast was explored by Alonzo de Piñeda in 1519; the city was first settled in 1839, and incorporated as a city in 1852. Its history included episodes of the Mexican War and the Civil War. Corpus Christi has a city-manager form of government, with mayor and commissioners. The water and gas systems are city owned. Pop. (1930) 27,789; (1940) 57,301; (1950) 108,287.

• **CORPUS CHRISTI**, Festival of, a feast instituted by the Roman Catholic Church in honor of the mystery of the Eucharist, observed on the first Thursday after Trinity Sunday. The feast is due to St. Juliana (1193-1258), prioress of Mont Cornillon, near Liège, Belgium. Her veneration for the Host led her to propose a special feast in its honor, and this was instituted as a diocesan feast by Robert de Thorete, bishop of Liège, in 1246, and first celebrated the following year. It was not extended to the whole church, however, until the archdeacon of that diocese, Jacques Pantaléon, became pope in 1261, as Urban IV. The latter published the bull *Transiturus*, Sept. 8, 1264, ordering the celebration of the feast throughout the church. But the pope's death a month later prevented its spread until the Council of Vienne (1311-1312), when Clement V published a decree incorporating that of Urban IV, after which it found general acceptance. At the request of Urban IV a remarkably beautiful office was written for the feast by St. Thomas Aquinas.

While the procession of the Host is not mentioned in either papal decree, it originated about 1275 and soon became the most distinctive feature of the feast; crowds of richly dressed nobles, magistrates, merchants, and guildsmen forming the procession in the cities. This feature is important in the early history of the drama for the miracle and mystery plays presented by members of the trade and craft guilds. At the Reformation, the Feast of Corpus Christi was one of the first holidays abolished by Luther. The procession, which may be held on the Thursday of the feast, is usually held in the United States on the Sunday following.

CORPUS CHRISTI COLLEGE, Cambridge University, England, sometimes called Benet College, was founded in 1352 by the united guilds of Corpus Christi and the Blessed Virgin, two fraternities which used to meet for prayers at Saint Benedict Church and Saint Mary's respectively. The endowments of the college were considerably increased by Archbishop Matthew

Parker, who also bequeathed to it his valuable collection of manuscripts. It has a fine collection of plate and the Lewis collection of printed books. Christopher Marlowe and John Fletcher were members of Corpus Christi.

CORPUS CHRISTI COLLEGE, Oxford University, England, a comparatively small college founded in 1516 by Richard Fox, bishop of Winchester and lord privy seal, under a license from Henry VIII. There are about 100 undergraduates. The college counts among its famous men Nicholas Udall, author of *Ralph Roister Doister*; Richard Hooker; John Keble, the hymnologist; and Thomas Arnold, the master of Rugby.

CORPUS DELICTI, kôr'pûs dê-lik'ti (literally "the body of the crime"), in Scottish law, those external marks, facts or circumstances which accompany a crime, and without the proof of which the crime is not supposed to be established. Thus the corpus delicti of homicide is establishing the fact that the person has died of violence, not merely that he has died. According to German law no crime can be established unless the corpus delicti is clearly present, and self-accusation or confession without this does not empower a court to convict.

CORPUS DOCTRINAE (Lat. "body of doctrine"), in German ecclesiastical history, the name given to each of several collections of theological writings promulgated by various German Protestant churches during the 16th century. Among the most important of these collections were the *Corpus Misnicum* or *Philippicum* (1559), enforced by the elector of Saxony, containing the Apostles', Nicene and Athanasian creeds, the Augsburg Confession and Melancthon's *Loci Communes*; the Pomeranian of 1561; that of Nurnberg of 1573; and the Hamburg (1560), Brunswick (1563), Pomeranian (1564), Prussian (1567), Brunswick-Wolfenbüttel (1569), Saxon (1570, called *Corpus Thuringicum*); and others of a Lutheran character. These were all superseded in 1580 by the *Formula Concordiae*.

CORPUS JURIS CANONICI, kôr'pûs jôô'ris kâ-nôn'i-si, the body of laws for government of the church enacted by popes, councils, and synods, or drawn from the writings of the fathers, and the whole approved and promulgated by the Holy See. The first compilation was that of Gratian, the Camaldolese monk, professor of theology in the University of Bologna, who about 1150 compiled the *Concordantia Discordantium Canonum*.

In the reign of Henry VIII the English Parliament ordered a revision of the *Corpus Juris Canonici* to make it conform to the new order of things brought about by the law of the king's supremacy in matters of religion; meanwhile the old system was to hold so far as might consist with the new order. But no revision has been made, and hence, with a few reserves, the *Corpus Juris Canonici* is law for the Church of England. See also CANON LAW.

CORPUS JURIS CIVILIS. See CIVIL LAW.

CORPUSCLE, in anatomy, a small, usually microscopic, body regarded by itself and defined

by some qualifying term. Examples are the blood corpuscles or blood cells (see BLOOD); the Malpighian corpuscles of the kidney and the spleen; the tactile corpuscles, also known as Meissner's and Wagner's corpuscles, found in certain papillae of the skin of the hand and foot; the taste corpuscles or taste buds; and the Pacinian corpuscle (q.v.).

CORPUSCULAR PHILOSOPHY, a name sometimes applied to the atomic philosophy taught by Leucippus and Democritus (qq.v.). According to their doctrine, matter is eternal, and everything in the universe, including the soul, is produced by a special arrangement and aggregation of minute, indivisible bodies or particles called atoms. These atoms are of various sizes and shapes and, in some forms of the theory, of different qualities. It is on these primary differences, combined with the endless varieties of position and figure, that distinctions between things are based. Change is only a rearrangement of atoms caused by their unceasing primary motions. This philosophy was elaborated and developed by Epicurus and other thinkers, and received its finest expression in the great poem of Lucretius, *De Rerum Natura*, q.v. (*On the Nature of Things*). It may be regarded as an ancient form of the modern atomic theory (q.v.), which, however, differs from it in being, not a philosophy of the universe, but merely a hypothesis concerning the physical constitution of matter, adopted in order to give convenient expression to scientific facts.

CORPUSCULAR or EMISSION THEORY OF LIGHT. See ELECTRON THEORY; LIGHT—*Nature of Light*.

CORREA DA SERRA, kōōr-rā'à thā sēr'rá, José Francisco, Portuguese statesman, scholar, and botanist: b. Serpa, Portugal, June 6, 1750; d. Caldas da Rainha, Sept. 11, 1823. He was educated in Rome and Naples, and in 1779 was among the founders of the Portuguese Academy of Sciences. To escape the Inquisition, he went to France in 1786, and there became closely associated with the naturalist Auguste Broussonet. From 1797 to 1802 he served as secretary at the Portuguese embassy in London, and in 1813 went to the United States, where he continued his scientific studies. Appointed minister plenipotentiary of Portugal in Washington in 1816, he served in this capacity until 1820, when he returned to Portugal and was elected a deputy to the Cortes. His principal published work is *Colecção de livros inéditos da história portuguesa* (4 vols., 1790–1816).

CORREA GARCAO, kōōr-rā'à gēr-soun', Pedro António Joaquim (academic name CORYNON ERIMANTHED), Portuguese poet: b. Lisbon, Portugal, April 29, 1724; d. there, Nov. 10, 1772. The son of an official in the Ministry of Foreign Affairs, he was educated at the University of Coimbra, where he studied law and received his degree in 1748. In 1756 he played a prominent part in the founding of the Arcádia Lusitana, or Arcádia Ulyssiponense, an academy designed to free Portuguese literature from artificiality. Imprisoned by the marquês de Pombal in 1771, he died on the day he was released. Correa Garção was primarily a lyric poet. Besides sonnets, he wrote a number of odes and epistles

modeled after those of Horace and two comedies in 11-syllable verse: *Theatro novo*, which appeared in 1766; and *Assemblea*, containing the celebrated *Cantata de Dido*.

CORREGGIO, kōr-rād'jō (real name ANTONIO ALLEGRI DA CORREGGIO), Italian painter: b. Correggio, Italy, 1494¹; d. there, March 5, 1534. Little is known of his early life and training, but his first important work, the *Madonna with Saints* painted in 1514–1515 for San Francesco in Correggio, reveals familiarity with the styles of Raphael, Michelangelo, and Leonardo da Vinci. These influences continue throughout his career, even though all evidence points to his having been active almost exclusively in Correggio and nearby Parma. His own style is in the grand manner initiated by these men but has a markedly personal flavor, soft and poetical in the treatment of light and color, joyous and exuberant in overall expressive character. His most impressive works are a series of mural decorations, beginning with the ceiling of a room painted in 1518–1519 in the Convent of San Paolo at Parma. Then follow the boldly original frescoes in the dome of San Giovanni Evangelista at Parma painted between 1520 and 1524. Here the ascending figure of Christ in the center is watched by the Apostles who form a ring around the edge of the dome. The sharply foreshortened figures of the Apostles seated on clouds filled with angels give a strong sense of upward movement into space. This idea is further elaborated in his most famous work, the fresco decoration of the dome of the Cathedral of Parma, painted between 1526 and 1530. In this larger painting the eye is carried up through two concentric rings of foreshortened figures. The lower ring features the standing figures of the Apostles looking up at the group in which the Virgin Mary ascends to heaven in the company of many saints and angels. The complex interweaving of the figures and the many outthrust arms and legs serve both to increase the sense of movement and to convey a quality of exultation appropriate to the theme. These paintings were far ahead of their time. They met with mixed reactions then and their greatest influence was felt in the next century in the work of baroque muralists in Rome. Of Correggio's many altarpieces in oil, some, such as the *Madonna of St. George* (Dresden), are in the current mannerist style; others, such as the *Madonna with St. Jerome* (Parma) and the *Adoration of the Shepherds* (Dresden) anticipate the 17th century in their treatment of light and space. At the end of his life Correggio devoted himself mainly to themes from classical mythology. In these works his soft modeling and frank sensuousness create an expressive quality that is highly individual, as may be seen in his *Jupiter and Io* (Vienna) and *Leda* (Berlin). Correggio's influence and reputation grew steadily in the later 16th and 17th centuries. He was the founder of the school of Parma and his influence spread beyond Parma and is reflected in the academic style initiated by the Carracci in Bologna and Rome as well as in the work of more baroque artists in Rome and outside of Italy.

Consult Moore, T. S., *Correggio* (New York 1911); Bodmer, H. D. A., *Correggio und die malerei der Emilia* (Vienna 1942).

¹ Some authorities give c.1489.

CORREGGIO, commune, Italy, situated in Emilia-Romagna, in the Province of Reggio nell'Emilia, 8 miles northeast of the city of Reggio nell'Emilia. It owes its fame to the painter Antonio Allegri, known by the surname Correggio, who was born here in 1494; his statue stands in the main square. In the 15th and 16th centuries the court of the Correggeschi, lords of the town, was a brilliant center of learning and the arts; among its guests were Emperor Charles V and the poets Lodovico Ariosto and Torquato Tasso. The 16th century palace of the lords now houses the municipal library and the historical archives. Establishments in the commune produce wine, sausages, and pharmaceuticals. Pop. (1951) 19,338.

CORREGIDOR, kō-rēg'i-dōr (Span. kōr-rē-hē-thōr'), island, Philippines, situated in Cavite Province, at the entrance to Manila Bay, 3.5 miles south of the southern tip of Bataan and 28 miles west-southwest of Manila, which it was fortified to defend. Of volcanic origin, the island is shaped like a polliwog, 1 to 3 miles wide and 5 miles long, with an area of 2.25 square miles. It rises to a high point of 649 feet near its western end. San José, a trading and fishing community, is the only village on the island.

Although Corregidor was strongly fortified by the Spaniards in the 18th century, by the time of the Spanish-American War its defenses had deteriorated to such an extent that it offered no resistance to Commodore (later Admiral) George Dewey's fleet as it steamed past the island into Manila Bay on May 1, 1898. Corregidor became a United States military station in 1900. Fort Mills was established on the island, and its defenses were gradually strengthened. An extensive network of tunnels was dug in Corregidor, and Forts Frank, Drum, and Hughes were erected on the neighboring islets of Carabao, El Fraile, and Caballo, respectively. During World War II, United States forces on Corregidor held out under steady Japanese attack for 27 days after the fall of Bataan. Finally, on May 6, 1942, Lieut. Gen. Jonathan M. Wainwright was forced to surrender. The island was recaptured by United States forces on Feb. 16-22, 1945, and passed to the sovereignty of the Republic of the Philippines in 1947.

CORRESPONDENCE SCHOOLS AND COURSES. Adult education by means of courses conducted by correspondence is widespread in the United States and other countries. The movement developed from the university extension movement, which began in England in 1868. Spreading to the United States, it was furthered by the Chautauqua Institution (q.v.) and by the establishment of special correspondence schools, such as the short-lived Correspondence University of Ithaca, N. Y., founded in 1883, and the well-known International Correspondence Schools of Scranton, Pa., which grew out of a course in coal mining first offered in 1891. In 1892 a correspondence department was established at the University of Chicago, and correspondence courses were gradually instituted in other colleges and universities, notably in the land-grant colleges after the passage of the Smith-Lever Agricultural Extension Act in 1914. In 1915 the National University Extension Association was formed, and in 1926 the National Home Study Council, a trade as-

sociation of leading private correspondence schools, was established. Correspondence courses have been widely used in the armed forces, notably through the Armed Forces Institute.

CORREZE, kō-rāz', department, France, in Limousin, in the Massif Central. Bordered on the northwest by Haute-Vienne, on the north by Creuse, on the east by Puy-de-Dôme and Cantal, on the south by Lot, and on the west by Dordogne, it has an area of 2,272 square miles. The department is watered by the Corrèze, Dordogne, and Vézère rivers, whose hydroelectric resources have been extensively developed. The soil is not very fertile except in the river valleys, but livestock, barley, wheat, rye, tobacco, vegetables, corn, fruit, and potatoes are raised. Slate is quarried, and there are textile mills, tanneries, and food-processing plants in the towns. Brive-la-Gaillarde is the largest town, and Tulle is the capital. Corrèze is divided into 3 arrondissements, 29 cantons, and 289 communes. Pop. (1946) 254,601.

CORRIB, Lough, lök kōr'ib, lake, Ireland, situated in Galway and Mayo counties, south of Lough Mask, with which it is connected by a partly subterranean channel. The lake is navigable, as is its outlet, the Corrib River, which flows from the southeastern end into Galway Bay. About 27 miles long and 1 to 10 miles wide, Lough Corrib has an area of approximately 71 square miles. It contains many islands, among them Inchagoill, which has the ruins of two ancient churches.

CORRIENTES, kōr-ryān'tās, the name of a province and a city in Argentina.

(1) The province, situated in Mesopotamia, has an area of 34,500 square miles. It is bounded on the west and north by the Paraná River, which separates it from the provinces of Santa Fe and Presidente Perón (formerly the Chaco) and from Paraguay; on the northeast by Misiones; on the east by the Uruguay River, which separates it from Brazil and Uruguay; and on the south by Entre Rios. Corrientes is well watered (in places, marshy), and the soil is fertile. Sugarcane, tobacco, cotton, wheat, corn, rice, fruit, nuts, and olives are grown extensively, and sheep, cattle, and horses are raised. Pop. (1947) 525,463; (est. 1951) 590,495.

(2) The city, which is the capital of the province, is situated on the Paraná River about 25 miles below its confluence with the Paraguay, and 480 miles north of Buenos Aires, with which it is connected by rail and air. It has an imposing capitol, a cathedral in the Renaissance style, several interesting churches (Las Mercedes has a Renaissance façade, and La Cruz, rebuilt in 1808, is a pilgrimage center), the Museo Colonial, Histórico y de Bellas Artes and an academy of arts. The city serves as the processing and shipping center for the surrounding rich agricultural region, and it has shipyards, textile mills, sawmills, and tanneries. Founded in 1588, it was the scene of a battle during the war with Paraguay in 1865. Pop. (1947) 56,425.

CORRIGAN, Michael Augustine, American Roman Catholic prelate: b. Newark, N. J., Aug. 13, 1839; d. New York, N. Y., May 5, 1902. After attending St. Mary's College, Wilmington, Del., for two years, he entered (1855) Mount

St. Mary's College, Emmitsburg, Md., from which he was graduated in 1859. In that year he was one of the first 12 seminarians to enter the American College in Rome. Ordained a priest in 1863, he remained in Rome for a year of graduate study, receiving his doctorate in 1864. Returning to the United States, he became professor of dogmatic theology and sacred scripture at Seton Hall Seminary, South Orange, N. J. From 1868 to 1876 he served as president of the institution. He became bishop of Newark in 1873. His tenure was marked by notable advances, particularly in the foundation of charitable institutions and the establishment of parochial schools. In 1880 he was made archbishop of Petra and coadjutor to John Cardinal McCloskey, archbishop of New York. On the death of the latter in 1885, he succeeded as archbishop, being installed in the following year. During the 17 years he headed the archdiocese, it became one of the largest in the world. Archbishop Corrigan was particularly concerned with the problems of new immigrants, with education, and with questions of canon law.

CORRODENTIA, kŏr-ô-dĕn'shĭ-ă, an order of primitive terrestrial insects having a single metamorphosis, modified biting mouth parts, either short or long antennae, compound eyes which are usually large and well separated, three or no ocelli, a small and necklike prothorax, slender legs with two or three segmented tarsi, and no abdominal cerci. The insects are either wingless or have two pairs of wings, with the hind pair smaller than the front ones and with simple venation.

The order includes the book lice, which are wingless, and the bark lice, which almost always have fully developed wings. Probably the most important species is the deathwatch (*Liposcelis divinatorius*), wingless and pale yellowish, which occurs in almost every building and sometimes becomes exceedingly numerous. It is able to make a slight ticking sound which can be heard in the stillness of the night. A close relative is *Atropus pulsatorium*, which has similar habits. The Corrodentia feed almost entirely on fungus, but they also eat starches. The winged forms are common on moist tree trunks.

CORROSION. The corrosion of metals is a form of chemical deterioration. The problem is continuous, since all metals and their alloys are subject to some degree of corrosion under certain conditions. The resistance of a metal to corrosive attack depends on the nature of the corrosion product formed. Some metals, such as chromium and aluminum, form an adherent, impervious coating that prevents further corrosion by acting as a barrier to the corrodent. The extent to which corrosion takes place and the rate at which it proceeds depend on the metal or alloy used, the combination of metals and alloys in contact with each other or with nonmetallic materials, and the corrosive medium present. Since corrosion is a chemical and electrochemical phenomenon, an increase in temperature usually accelerates it.

Corrosion of metals results in a tremendous loss of materials and money. Various estimates have placed the annual cost of corrosion in the United States alone at over \$5 billion. The problem is extremely complex, and vast amounts of time and energy are expended in research.

Types.—Corrosion reactions can be classified as direct atmosphere or chemical attack, or as electrochemical action. Examples of direct atmosphere or chemical attack are the oxidation of iron and steel at elevated temperatures, the oxidation of aluminum and magnesium, and the tarnishing of copper. Electrochemical attack, which requires that a liquid be present, involves a transfer of electrons in which some positively charged ions in the corroding solution lose electrical charges, which are acquired by the metal or alloy going into solution, or being corroded.

Galvanic corrosion may be defined as accelerated electrochemical corrosion produced when one metal is in electrical contact with another, more noble (more resistant) metal, both being in the same corroding medium or electrolyte. This type of corrosion usually results in a higher rate of solution of the less noble metal and in the protection of the more noble metal. Galvanic corrosion is usually characterized by severe local corrosion at the point of contact of the dissimilar metals, if that contact takes place in the electrolyte.

Stress corrosion is corrosion accelerated by internal stresses or externally applied stresses. Not only may differential stress produce corrosion, but corrosion from any cause may produce a weakening in a part which may crack under a stress that would not otherwise have affected it. Corrosion fatigue is a form of stress corrosion in which the stresses are fluctuating or cyclic in nature.

Pitting occurs when corrosion is localized. This is most serious in containers, which may become perforated in a short time. Moreover, the pits, when small in area or few in number, can easily be overlooked.

Dezincification is a type of corrosion in brass in which zinc atoms are dissolved from the solid solution in preference to copper atoms. It results in a surface deposit of copper over a porous and weakened base. In a broader sense, dezincification includes any similar selective leaching of one component from an alloy.

Erosion corrosion occurs in the presence of rapidly moving liquids and turbulence, and is increased by the presence of suspended solids. In this form of corrosion, a surface weakened or made porous by corrosion is quickly eroded. Pumps, valves, ship propellers, and agitators are examples of equipment subject to erosion corrosion.

Prevention and Protection.—There are many methods of combating corrosion. They involve either removing, if possible, the causes of corrosion, or protecting the material. Preventive treatments include annealing, which can remove stresses to avoid stress corrosion; and the addition of certain elements to produce corrosion-resistant alloys.

Surface treatments to protect the metal are varied. A more resistant metal, such as cadmium, zinc, nickel, or chromium, can be electroplated on a more corrodible metal. Coating by dipping in a molten metal such as zinc or tin is an extremely important method. In coating iron with zinc (galvanizing), not only is the iron protected by a rustproof metal, but advantage is taken of galvanic action. If a break in the coating occurs and the iron is exposed, the zinc and iron form a galvanic couple, and the zinc is oxidized, protecting the iron.

Cladding (covering with another metal by a

cold rolling process), metallizing (spraying with a molten metal), and applying metallic paints are other methods of protection. Processes for coating steel with other metals include sherardizing (zinc coat), calorizing or aluminizing (aluminum coat), chromizing (chromium coat), and Irligizing or silicizing (silicon coat). Non-metallic coating methods include painting, lacquering, plastic coating, porcelain enameling, and the application of greases.

Another means of protection consists in the artificial building up of an oxide film or the production of a protective film of some other composition. The anodizing of aluminum and the blue color on some razor blades are examples of artificial oxidizing for protection. Other protective films are made by chemical surface treatments or dips. Phosphate coatings are produced on steel, and magnesium alloys are given surface treatments to improve corrosion resistance.

In another type of protection, use is made of electrochemical principles. This method, cathodic protection, consists in applying an electric current, either externally or by galvanic coupling, to a specific metal surface in such a manner that the usual electrochemical corrosion reactions are slowed or counteracted. Currents can be applied by an external source of power or by means of sacrificial anodes. Sacrificial anodes, usually made of zinc, magnesium, aluminum, or alloys of these metals, reduce the rate of attack on the metal to which they are coupled. Buried near steel pipes and spaced at proper intervals, sacrificial anodes are used to protect underground pipelines, and they are also used in ship propeller shafts.

Consult Woldman, N. E., *Materials Engineering of Metal Products* (New York 1949); Gillett, H. W., *The Behavior of Engineering Metals* (New York 1951); Stoughton, Bradley, Butts, Allison, and Bounds, A. M., *Engineering Metallurgy*, 4th ed. (New York 1953).

ALVIN S. COHAN,
Editor, "Journal of Metals."

CORROSIVE SUBLIMATE, mercuric chloride (HgCl_2). Also known as bichloride of mercury and perchloride of mercury, it is prepared by heating mercuric sulphate with dry sodium chloride. The mercuric chloride sublimes as a white, transparent, crystalline mass with a specific gravity of about 5.42 and a molecular weight of 271.52. It is soluble in about 20 parts of cold water and very soluble in alcohol and ether. Since it precipitates albumen, white of egg is an antidote to its effects. It is very poisonous, and is used as a germicide and externally in certain skin diseases. It is also employed in chemical analysis, tanning, photography, and metallurgy.

CORROSIVES, in medicine, substances which corrode the part of the body to which they are applied. Among them are acetic acid, exsiccated or burnt alum, ammoniated mercury, zinc sulphate, mercuric oxide, and antimonie chloride.

CORRUGATED IRON, sheet iron formed with parallel ridges and furrows, so that the cross-section is a continuous waved line. Flat sheet metal tends to buckle and get out of shape with every change in temperature. The corrugations, made in one direction, give it greatly increased stiffness and adapt it to numerous purposes for which it would otherwise be less

suitable. The sheet metal is corrugated by passing between ridged rollers, whose ridges are opposed like the teeth of gear-wheels. It comes out in the commercial form, and is frequently subjected to a process of coating with zinc, to protect it from oxidation, and is then known as galvanized corrugated iron. It is used widely for roofing and walling barns, sheds, warehouses, and other buildings.

CORRUPT PRACTICES ACTS. The effort to eliminate dishonest, irregular, and criminal methods of influencing public elections has resulted in the enactment of various laws to supplement the common law against bribery and corruption (see **BRIBE**). Such acts enumerate and define the corrupt or illegal practices and fix penalties for the same; they usually include bribery in any form, treating, undue influence, intimidation, personation of voters or aiding and abetting in the same, the making of false election returns, the solicitation of candidates for campaign contributions—save by political committees—the contributing of campaign funds to other than authorized agents, the making or receiving of campaign contributions under an assumed name, the rendering of a false declaration of election expenses, etc. Many laws forbid the acceptance of campaign contributions from certain sources, especially from corporations and from assessments levied on officeholders in the civil service.

British Acts.—Statutes to prevent bribery and corruption have been passed in 1729, 1809, 1827, 1842, 1854, 1868, and 1883. The most important of these are the Corrupt Practices Prevention Act of 1854 (which repealed all previous legislation and dealt especially with the practice of electoral bribery), the Parliamentary Elections Act of 1868, and the Corrupt and Illegal Practices Prevention Act of 1883, which incorporated the act of 1854. The act of 1883 defines and fixes the penalties for the criminal offenses classed as corrupt practices, which consist of bribery of seven different varieties, treating, undue influence and personation, all of which are punishable by fine or imprisonment and by loss of political rights for seven years. If a candidate for a seat in Parliament be found guilty by a trial court of committing or consenting to corrupt practices, his election is void and he is forever debarred from representing the district in Parliament; but should only his agent be proved guilty of corrupt practices, the candidate, though personally innocent, may not be elected for the same constituency for a period of seven years. The sections of the act relating to illegal practices as distinguished from "corrupt" practices are intended to limit election expenses. For boroughs of 2,000 voters the maximum expenditure is fixed at £350 while £650 is allowed for counties with the same number of voters with an extra allowance for each additional thousand in the district. The legal expenditures are enumerated, such as printing and meeting halls, etc., and the number of paid agents is limited. Within 35 days after the election the candidate's agent must file a statement of expenses, certified by the candidate. The corrupt practices law applies equally to parliamentary, municipal, county, and parish council elections, and the punishments provided for minor officials correspond with those imposed on parliamentary candidates; a municipal candidate personally guilty of corrupt practice

is forever incapable of holding office, but if guilty merely through acts of his agents he is incapacitated only for three years.

United States Acts.—The federal government has legislated less regarding corrupt practices than the states, since the latter control most of the election machinery. In 1907 Congress passed an act forbidding corporations to contribute to campaign funds in federal elections; on June 25, 1910 an act was approved providing for publicity of political contributions, requiring each political committee to file a financial statement within 30 days after a national election, and on Aug. 19, 1911 an act amending this act was approved extending its provisions to individual candidates as well as to committees. Candidates for the House of Representatives under these acts were allowed to expend a maximum of \$5,000 and for the Senate of \$10,000. The candidates for the lower house were obliged to file with the clerk not less than 10 nor more than 15 days prior to the election (whether it were a primary election, a nominating convention or a general election) a preliminary itemized statement of receipts and their sources and of expenditures and their objects, besides the more complete statement to be filed within 30 days after the election. The act provided that senatorial candidates must file with the secretary of the Senate (not less than five nor more than 10 days prior to the day on which the state legislature first balloted for such candidate) a similar itemized statement of receipts and expenditures, but since 1913, when the Seventeenth Amendment to the Constitution, providing for direct election of senators, was declared in force, senatorial candidates follow the practice of the representatives.

The federal act of 1925 specifically repealed all previous acts and enacted that the treasurers of all political committees operating in more than one state must file sworn statements showing the addresses of all contributors of one hundred dollars or over with the clerk of the House of Representatives on certain specified dates; also the names and addresses of all persons receiving ten dollars or more from the funds collected and the purpose of such disbursements must be stated. Candidates for both Senate and House are required to file itemized statements of all contributions to their campaign at stated times before and after elections. The act fixed \$10,000 as the maximum amount that may be expended by a senatorial candidate and \$2,500 by a candidate for the House of Representatives or an amount reached by multiplying by three cents the number of votes cast at the last general election for the office sought, but not to exceed \$25,000 for a senator or \$10,000 for a representative. Certain types of political promises are also forbidden, such as promise of employment in return for votes. National banks are forbidden to contribute at elections at which members of the Congress or presidential electors are chosen. Corporations organized under authority of the Congress are also forbidden to contribute toward the election of presidential electors or of members of the Congress. Members of Congress, congressional candidates, and other officers and employees of the government are forbidden to solicit campaign contributions directly or indirectly from officers or employees of the government.

Various proposals relating to the amendment of the Corrupt Practices Act of the United States

government were made, but only minor amendments were adopted until 1939.

HATCH ACT

The measure popularly known as the Hatch Act was passed by both houses of the Congress in 1939 and signed by the president. Amendments were adopted in 1940. The name attached to these acts came from their chief sponsor in the Senate, Senator Carl A. Hatch, of New Mexico.

Both the original act and the amendments thereto mark important developments in the election laws. Briefly they provide:

1. That it shall be unlawful for any person to intimidate, threaten, or coerce, or attempt to intimidate, threaten, or coerce any other person for the purpose of interfering with the right of such other person to vote or not to vote as he may choose in any election at which federal officials are chosen.

2. That it shall be unlawful for any person employed in any administrative position of the United States government, or any department thereof, or any person employed in any administrative position of any state government in connection with an activity financed in whole or in part by loans or grants by the United States, to use his official authority for the purpose of interfering with or affecting the election or nomination of any candidate for the office of president, vice president, presidential elector, member of the Senate, or member of the House of Representatives, or delegates or resident commissioners from any territory or insular possession.

3. It shall be unlawful for any person directly or indirectly to promise employment or work provided for or made possible in whole or in part by any act of Congress, as a reward for any political activity; and another section of the act makes it equally unlawful to threaten to withhold any work or employment on account of any political activity.

4. It is likewise made a violation of law to deprive, attempt to deprive, or threaten to deprive by any means, any person of employment or work, whose work or employment is made possible by any act of Congress appropriating funds for work relief or relief purposes, on account of "race, creed, color, or any political activity in support of or opposition to any candidate or any political party in any election." Another section of the act expressly prohibits the soliciting or receiving of any assessment or contribution for political purposes from any person known to be receiving compensation or employment from funds appropriated by an act of Congress for work relief or relief purposes.

5. Copied from the rules of the Civil Service Commission with reference to the employees of the federal government in the competitive civil service, the original act provides: "No officer or employee in the Executive branch of the federal government, or any agency or department thereof, shall take any active part in political management or in political campaigns." While there are certain exceptions to this rule enumerated in the act, the effect of it is to withdraw from political activity practically all the employees of the federal government.

In substance, the foregoing provisions are contained within the original act passed in 1939. In 1940, the Congress extended the same rules and prohibitions to employees in the states who

exercise functions in connection with any activity financed in whole or in part by federal funds. With the exception of the provisions of the law prohibiting political activity on the part of employes, violations of the other sections are made criminal offenses; violations of the provisions relating to political activity are punishable by loss of position or by suspension without pay for not less than 90 days.

Certain provisions were included in the act of 1940 which did not relate to the original act passed in 1939. These new provisions struck directly at the use of excessive campaign funds. During the debate, Senator John Hollis Bankhead, of Alabama, offered an amendment, which was adopted, by which it was declared to be unlawful for any person directly or indirectly to make contributions in an aggregate amount in excess of \$5,000 during any calendar year in connection with any campaign for nomination or election to or on behalf of any candidate for an elective federal office. Violation of this provision of the law carries a penalty of a fine not to exceed the sum of \$5,000 or imprisonment for not more than five years.

When the bill as it passed the Senate, including the Bankhead amendment, went to the House of Representatives, the House added a new provision relating to expenditures by campaign committees. In substance, the House amendment provided: "No political committee shall receive contributions aggregating more than \$3,000,000, or make expenditures aggregating more than \$3,000,000 during any calendar year." That section provides that the penalty set forth in section 302 of the federal Corrupt Practices Act of 1925 shall apply to its violations.

Another interesting amendment was added in the House of Representatives. It makes it unlawful for any person, partnership, or corporation to purchase or buy goods, commodities, advertising, or other articles of any kind, where the proceeds of such purchase would directly or indirectly inure to the benefit of or for any candidate for an elective federal office, or any political committee, or any organization engaged in furthering or advancing the nomination or election of any candidate for any such office, or the success of any national political party. This provision prohibiting the sale of advertising and commodities originated from certain practices engaged in by both the Democratic and Republican parties in times past. It had been the custom to prepare more or less elaborate books dealing with the national conventions. Advertising in these convention books was sold to the extent that the method became a rather effective means of raising campaign funds. The method had long been criticized as an evasion of the Corrupt Practices Act with reference to contributions to campaign funds by corporations. Corporations had long been prohibited from making campaign contributions, but in many instances corporations subscribed and paid for space in the convention books. Sponsors of the legislation insisted such practices were intended to be prohibited by the Corrupt Practices Act; they sought to completely outlaw such transactions.

The criminal sections of these acts are enforced through the Department of Justice in the ordinary criminal law enforcement methods.

The provisions of the law relating to prohibiting political activity on the part of federal em-

ployes are enforced by the various departments. The Civil Service Commission has concurrent enforcement jurisdiction in the case of persons occupying position in the competitive civil service.

In the provisions of the 1940 amendments which relate to employes within the states, who are not technically federal employes but whose employment is made possible by the use of federal funds, a difficult question of enforcement arose. Obviously, the federal government has no power to compel the discharge of any employe within the states; neither would it seem proper to leave the enforcement of the federal statute entirely to state authorities. Finally, it was decided to provide for enforcement by and through the Civil Service Commission of the United States. Therefore, the Civil Service Commission was charged with the responsibility and duty of enforcing those provisions of the law which deal principally with employes within the states. Provisions providing for hearing before the Civil Service Commission are set forth in the act; and after such hearing, the commission must determine whether any violation has occurred. On such finding, the appropriate state official is notified; and if the offending employe is not removed within 30 days after notice of such determination by the commission, the appropriate federal agency is required to withhold from the federal funds supplied to such state agency an amount equal to two years' compensation at the rate such officer or employe was receiving at the time of the law's violation.

Probably never before in the history of the country has drastic legislation of the kind described ever been enacted at a time when a national campaign was approaching. In the beginning, the proposed legislation was not regarded very seriously; final passage of such measures was not deemed to be possible.

According to the sponsors of the legislation, the principle embraced in these laws is not new; political activity of federal employes in the classified civil service has long been prohibited. The extension of such prohibitions to employes in the states is new. Those features of the bill were sharply criticized and extensive debate was held in both branches of Congress. The principal objection was based upon the grounds that following federal funds into the states invaded the doctrine of states' rights. Sponsors of the legislation defended it vigorously on the grounds that no invasion of states' rights was involved. The simple theory is that the federal government, having prohibited its own employes from political activity, wished to extend these same prohibitions to employes in the states whose employment is made possible by federal funds.

The whole purpose of this legislation is to strike a direct blow at what is commonly known as the spoils system. Advocates of the legislation contend that by removing employes in active political life, one of the greatest obstacles toward the establishment of a genuine system of merit will be removed.

Senator Hatch himself severely criticizes the spoils system in federal, state, and local governments. He advanced the legislation upon the theory that it would lead to further progress in the development of the merit system, not only in the federal government but in the several states and municipalities. "The objective in this regard is not fully accomplished by the legislation thus far enacted," the author states. "It will take

more legislation and development and correction within the merit system itself to accomplish that, even in the federal government alone."

To carry out the complete objective will require separate laws in the states themselves. In this connection, it is interesting to note that the movement started in the federal government has already reached into several states. New York State, for instance, has passed a law putting many of the provisions of the federal legislation into effect in that state. Several other states have enacted similar legislation.

It is not too early to determine the effect of such legislation in political campaigns. Campaign funds have been partially curtailed. It is possible that large contributions from individuals may hereafter be made by ruse or evasion, but excessively large campaign contributions will be the exception rather than the rule, as has been the case in the past. It is believed by many that the progress made by this type of legislation will be continued, that other laws carrying out the general aims of this legislation will be more easily enacted, and that a definite start or beginning has been made. See also CIVIL SERVICE.

CARL A. HATCH,

United States Senator from New Mexico.

EDITORIAL NOTE: The Taft-Hartley Act of 1947 prohibits labor unions from making contributions or expenditures from union funds in connection with an election to political office.

STATE LAWS

All the states and territories have enacted corrupt practices acts of some sort. The earlier laws related chiefly to bribery, betting on elections, etc., but the latest laws so carefully regulate expenditures by party candidates and committees and define legal and illegal practices with such particularity that few loopholes exist for "honest graft," the most tempting opportunity for evading the law being furnished by the allowances for "necessary personal expenses" (comprising expenditures for traveling, stationery, postage, express, telephone and telegraph services, etc.), which need not be included in the financial statement.

New York was the first state to legislate against corrupt practices at elections, passing an act in 1890 requiring candidates to file itemized statements of expenditures on pain of imprisonment and loss of office. As the operations of political committees were not restrained by this law, the defect was remedied by a supplementary law providing that within 20 days after the election the treasurer of such committee shall file an itemized statement giving amounts of contributions with names of donors and details of all expenditures over \$5 with the objects and names of persons to whom payment was made. Bribery, personation, illegal registration, the use of false naturalization papers, and the aiding of another to do so are punishable by imprisonment not exceeding five years, while giving a bribe also disqualifies for holding office and receiving a bribe disfranchises for five years. Illegal primary voting is a misdemeanor as is making a false declaration of party affiliation. The amounts that candidates for various offices may spend are carefully listed, graded and defined, as are also the legitimate expenses that may be incurred by all others connected with the elections. In 1909 New York also prohibited all corporations, save political associations, to make campaign contributions

or to expend money for any political purpose whatsoever, and an officer, stockholder or agent of any corporation guilty of such practice may be imprisoned for one year and fined a sum not exceeding \$1,000. Candidates may not be solicited for contributions nor are judicial candidates allowed to donate. Influencing voters by promising employment or office was first prohibited by Massachusetts, which also forbids the publication of unsigned political advertisements, the subsidizing of newspapers to favor a particular candidate, the contribution of funds to political parties by certain corporations, and the payment of naturalization fees by political committees.

Several states prohibit electioneering on election day and the giving away of liquor within a certain distance of the polling places, and a few states now bear a part of the election expenses. Oregon limits the amount to be expended on an election and pays part of the expenses of informing voters about candidates and parties. In 1909 Colorado provided that only the state and the candidates should pay the expenses of electing state, district and county officers at general elections. Each political party receives from the state 25 cents for every vote cast for governor by that party in the preceding election, the money being paid to the state chairman who is bonded to guarantee the legitimate use of such funds and also to vouch that one half of the sum received by him is distributed among the county chairmen. Candidates may personally contribute a sum regulated in accordance with the amount of the prospective salary or fees. Other persons or corporations contributing to any party candidate or committee or receiving such contributions are guilty of felony. In 1915 Nevada limited the expenditures of any party to \$15,000 during one campaign. In the same year Kansas prohibited a candidate from spending more than 10 per cent of the office salary for the first year, on expenses other than travel. This state also forbids any candidate or organization to provide conveyances to take voters to the polls. California penalizes frauds in connection with initiative, referendum and recall petitions, making such practice a felony punishable by imprisonment for from 1 to 15 years. Most of the states require the publication of financial statements at specified intervals before election day and complete sworn statements within a certain time after election, various penalties being imposed for failure to comply. Nebraska requires not only the itemized statement to be issued 15 days before election but also daily reports thereafter until election of all contributions over \$25. In 1911 Indiana provided that candidates must conduct their financial operations through "political agents" to prevent the irresponsible distribution of political funds. South Dakota requires a secretary for each political committee who must receive all contributions, transfer them to the treasurer and approve all vouchers before the latter officer may expend the funds. Most states require that these statements be open to public inspection. See also BALLOT; BRIBE; ELECTION FRAUDS, SAFEGUARDS AGAINST; LOBBY.

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CORRUPTION OF BLOOD, in law, the incapacity to inherit, or pass an inheritance, in consequence of an attainder to which the party has been subject. In the United States it was abolished by the federal Constitution. See **ATTAINDER**; **FORFEITURE**.

CORRY, city, Pennsylvania, in Erie County; altitude 1,429 feet; on the Pennsylvania and the Erie railroads; 36 miles southeast of Erie. The surrounding area is devoted chiefly to agriculture and dairying. Development of the Pennsylvania oilfields contributed to the growth of the town, the industries of which include making airplane parts, oil drilling engines, machines, springs, and steel furniture. There is a public library. The state fish hatchery is nearby. Corry was settled in 1860 and named for Hiram Corry, one of the first settlers. Incorporation as a city took place in 1866. The water, power, and light systems are privately owned. Government is administered by a mayor and council. Pop. (1930) 7,152; (1940) 6,935; (1950) 7,872.

CORSAC, kôr'sāk (*Vulpes corsac*), a species of fox or dog found in central Asia, Siberia and Mongolia, sometimes called the steppe-fox. Its color varies from reddish-yellow in summer to a whitish tinge in winter. The Kirghiz hunt the corsac for its soft, thick, warm fur. It is gregarious, prowls by day, burrows and lives on birds and eggs. The corsac is often seen in zoological gardens. It is much like the American kit-fox (q.v.) in its habits.

CORSAIR, kôr'sâr (Fr., in origin identical with "courser" or "cruiser"), a term employed to denote pirates or their vessels. By the princes of the coast of Barbary the corsairs of their states were commissioned to attack the merchant ships of foreign nations, and they became the scourge of the Mediterranean. See **BARBARY POWERS**, **UNITED STATES TREATIES AND WARS WITH THE**.

CORSAIR, *The*, poem in heroic couplets by Lord Byron, published in 1814. Conrad, pirate chief on an Aegean island, though a man of many vices, is brave and chivalrous. A characteristically Byronic tale, it was extravagantly praised by Mme. de Staël, Stendhal, and Vigny.

CORSE, kôrs, John Murray, American military officer: b. Pittsburgh, Pa., April 25, 1835; d. Winchester, Mass., April 27, 1893. He was a cadet at West Point for two years, and in 1860 became a lawyer, but enlisted in the Union Army at the outbreak of the Civil War. He was a brigadier general in 1864; commanded a division in Georgia, and upon the advance of the Confederates against Allatoona, Sherman helio-

graphed him, "Hold the fort for I am coming," which inspired Philip P. Bliss to compose the famous hymn *Hold the Fort*. General Corse repulsed the enemy and accompanied Sherman on the march to the sea. After the war he was successively collector of internal revenue in Chicago and postmaster of Boston.

CORSET, kôr'sêt, an article of dress worn generally by women for the purpose of keeping the form erect and trim. It is usually made of two thicknesses of white jean, silk, nylon, or other material, stiffened by whalebones or steels or it may be made wholly or in part of elastic or webbing. It was used in Germany in the Middle Ages, and was introduced into France about the time of the Revolution. At an early age it was in use in Great Britain and Ireland, at least in the 18th century, and was worn by little girls as a support for the body. The styles of corsets have changed with the styles of dress, the modern tendency being to emphasize the natural figure. Rubber corsets are used as flesh reducers.

CORSICA, kôr'si-kâ (Fr. *CORSE*), an island and French department in the Mediterranean Sea. It is separated from the island of Sardinia, on the south, by the Strait of Bonifacio, about 10 miles wide, and its shortest distance from the mainland is 50 miles. It is distant from France about 100 miles. It is somewhat irregular in shape, but tolerably compact, except toward the north, where it terminates in a long and narrow tongue of land about 22 miles long by about six miles broad. Greatest length, north to south, 114 miles; greatest breadth, near its center, 53 miles; area, 3,367 square miles. The east coast is remarkable for its uniformity, presenting a line which is broken in only one or two places by comparatively small indentations. To this the west coast presents a striking contrast, a number of deep bays following each other in rapid and almost uninterrupted succession. Of these the most important, proceeding north to south, are the gulfs of Saint Fiorenzo, Calvi, Porto, Liscia Ajaccio and Valinco. The interior is traversed by a mountain chain, which has its principal direction north to south, but throws out several lateral branches, particularly to the northwest. The highest summits are near the center of the island, including Mont Cinto, 8,881 feet, and Mont Rotondo, 8,612, while others exceed considerably 7,000 feet and the greater part of the year are covered with snow. The mountain masses are chiefly composed of granite and porphyry, and appear to be generally overlaid by extensive beds of limestone. From the east and west sides of the chain numerous streams descend to the opposite sides of the coast. They are mere torrents, short and rapid, and altogether unfit for navigation. The largest are the Golo and Tavignano. Along the river mouths large quantities of debris and alluvium have accumulated which, preventing the egress of the waters, have gradually formed on the east coast a series of lagoons and morasses and made that part of the island very unhealthy; but with this exception the climate is one of the finest in Europe. The heat is sometimes excessive, but the sky is generally clear and the air bracing. The summits of its many lofty mountains are covered with pines, evergreen oaks, cork trees, beeches and chestnuts. In other

parts the hillsides are overgrown with dense thickets of cistus, myrtles, arbutus and other shrubs. Numerous valleys lie between the lofty ridges, and sometimes plains of considerable extent occur, the soil of which is generally fertile and well adapted for the growth of all the ordinary cereals. Agriculture is in a backward state, and the island produces scarcely a sufficient amount for local consumption. Large tracts of land are uncultivated; the farming implements in use are of the crudest form. The slopes are covered with vineyards, and the olive trees appear to be indigenous. The mulberry, orange and citron succeed well, particularly in the lower valleys near the coast. One of the most valuable productions of the more elevated districts is the chestnut, on which, at least during the winter months, the poorer inhabitants principally subsist.

Among domestic animals, the first place for usefulness and numbers is due to mules and goats. The principal wild animals are the boar and the fox. Deer are numerous and all the smaller game and wild fowl are common; eagles, vultures and numerous other birds of prey frequent the mountains, and fish abound. The principal source of mineral revenue is derived from quarries of fine granite, porphyry and marble. Neither manufactures nor trade have made much progress. The chief exports are wine, brandy, olive-oil, chestnuts, fruit and fish. The inhabitants have the reputation of being haughty in temper, passionate and revengeful. Corsica is one of the countries in which the *vendetta* obtains, the taking of private vengeance for the blood of a relative, of which a striking picture is to be found in Merimée's *Colomba*.

From the Phoenicians, its first colonists, the island took the name of Cynos; and from the Romans that of Corsica. On the decline of the Roman empire it was seized by the Goths and passed from them to the Saracens. In 1481 it fell under the dominion of the Genoese, who retained it, with some interruption, till 1755, when a great part of it was wrested from them and made independent by the celebrated Gen. Pasquale Paoli. France, claiming it on a pretended cession by the Genoese, obtained forcible possession of it in 1768, after the inhabitants had distinguished themselves by a long and valiant resistance. At the time of the French revolution, Paoli, who had taken refuge in England, returned to his native land, and unfurling the banner of the death's head (the old Corsican arms), he summoned his countrymen to strike for their independence. With the assistance of the British, who landed Feb. 18, 1794, he reduced Bastia in May and Calvi in August. Corsica was constituted a kingdom under the government of a viceroy (General Elliot); the constitution and laws of Great Britain were adopted, and a parliament such as Ireland had was established. But a large part of the people were averse to the British, whom they regarded as heretics, and the French party again appeared on the island in October 1796. Sickness had reduced considerably the effective force of the British, and their position was rendered still more critical by the French occupation of the neighboring city of Leghorn, and in consequence they evacuated Corsica. In 1814 it was again in British occupation.

Since 1815 the island has formed a French department. For administrative purposes it is

divided into four arrondissements—Ajaccio (the capital), Bastia, Corte and Sartène, subdivided into 62 cantons and 364 communes. The greatest individuals to whom Corsica has given birth are Paoli and Napoleon. Pop. (1946 est.) 267,873.

CORSICANA, kôr-sî-kân'â, city, Texas, seat of Navarro County; altitude 448 feet; on the Saint Louis Southwestern, Southern Pacific and the Trinity and Brazos Valley railroads, and two federal and two state highways, 60 miles south of Dallas. An Odd Fellows Orphans' and Widows' Home and the State Orphan Home are here. Three charitable trusts amount to about \$2,000,000. The adjacent territory raises cotton, grain, fruit, cattle, and sheep; and has been producing oil since 1895 from shallow wells, but since 1923 from deep wells. Fuel oil and natural gas are extensively used for heat and power production. Corsicana has large oil refineries, cotton and cottonseed-oil mills, oil-well and oil-field supply houses, brick plants, cotton gins, lumber yards, a farm-implement factory, cotton warehouses, a chili factory, etc. The county was named for J. Antonio Navarro, who came from Corsica—and Corsicana means Corsican. The city is governed by a mayor and a commission. Pop. (1940) 15,232; (1950) 19,211.

CORSINI, kôr-sē'nē, **FAMILY**, a famous Florentine family, known since the 13th century.

SAINT ANDREA: b. Florence, Nov. 30, 1302; d. Fiesole, Jan. 6, 1373. He early entered a monastery in Florence, where he remained for 40 years; he was then made bishop of Fiesole and sent as a papal legate to Bologna, where he was successful in making peace between factions and putting an end to civil war.

LORENZO (1652-1740), became Pope as Clement XII (q.v.). He restored the Corsini Palace in Rome now containing the interesting Corsini Gallery.

TOMMASO, Italian politician: b. Rome, Nov. 5, 1767; d. there, 1856. He was a supporter of Pope Pius IX and was made senator (chief magistrate) of Rome; when the pope fled from Rome, Corsini went to Florence for a time, but later returned to Rome.

His brother **NERI**: b. 1771; d. 1845, was a member of the council in Tuscany under the grand dukes Ferdinand III and Leopold II.

NERI, Italian politician: b. Florence, Aug. 13, 1805; d. Dec. 1, 1859. He was the younger son of Thomas Corsini and became one of the leaders of the Liberal party in Tuscany. In 1848 he was minister of war and foreign affairs; later the Grand Duke Leopold II offered him the first place in the ministry and he immediately proposed to establish the constitution. The duke, however, would not consent to this and went into exile. The provisional government then organized sent Corsini to London to represent Tuscany there.

CORSNED, kôrs'nēd, or **MORSEL OF EXECRATION**, a form of trial or purgation formerly made use of in England. See **ORDEAL**.

CORSO, kôr'sô, an Italian term first applied to races of riderless horses, then to the long lines of gaily decorated carriages driven through the principal streets of the cities, and afterward to the most fashionable carriage-drive in the city. The Corso at Rome, stretching from the Piazza del Popolo to the Capitol, and dividing the city

into the two equal parts, is nearly 3,500 paces in length, and is flanked by many high and splendid edifices; but its breadth is not proportionate, so that in most parts no more than three vehicles can go abreast.

CORSSEN, kôr's'en, **Wilhelm Paul**, German philologist: b. Bremen, Germany, Jan. 20, 1820; d. Berlin, June 18, 1875. After studies in philology at Berlin and two years of teaching at Stettin, he was called in 1846 to lecture at Schulpforte, where he remained until 1866, when ill health compelled him to retire. His earliest important work was his treatise on the pronunciation and accent of Latin, *Über Aussprache, Vokalismus und Betonung der lateinischen Sprache* (1858-1859; 2d ed. 1868-1870), for which he received the prize offered by the Royal Prussian Academy of Sciences for the best work on that subject. His *Über die Sprache der Etrusker* (1873-1875), in which he labored with great ingenuity and vast learning to prove against the world that the Etruscan language was cognate with that of the Romans, started a controversy in which his arguments were violently opposed by classical students everywhere.

CORT, kôrt, **Cornelis**, Dutch engraver: b. Hoorn, Netherlands, ?1536; d. Rome, Italy, 1578. After working in his youth for a printseller at Antwerp, he went to Venice in 1566 and was warmly welcomed by Titian, some of whose pictures he was employed to engrave. Cort finally settled at Rome in 1571 and established a school of engraving there. He made the first engraving of Raphael's *Transfiguration* and about 150 prints from other Italian and Flemish masters, including Correggio, Maarten van Heemskerck, the miniature painter Giulio Clovio, and Michelangelo. Agostino Carracci was his pupil. His work was not superseded until the advent of Hendrik Goltzius. The number of Cort's engravings, considering the shortness of his life and the size and fine style of the plates, betokens a considerable amount of industry; but although he had a complete mastery of engraving, he is criticized for deficiency in discriminating delicate shades, relative distances, and the nice varieties of expression.

CORT, Frans de, Flemish poet: b. Antwerp, Belgium, June 21, 1834; d. near Brussels, Jan. 18, 1878. As a singer of the quiet joys of home life and conjugal happiness he has few peers in any literature. His original homely lyrics appeared in *Liederen* (1857-1859), *Zing-Zang* (1866), and another volume of *Liederen* (1868). He also translated into Flemish verse *The Finest Songs of Robert Burns* (1862), the *langue d'oc* songs of the Gascon poet Jacques Jasmin, and some German verse. In 1861 he founded the periodical *De Toekomst* (*The Future*). He edited the posthumous poems of Johan Michiel Dautzenberg, his father-in-law, in 1869.

CORT, Henry, English ironmaster and inventor: b. Lancaster, England, 1740; d. London, May 23, 1800. Having at an early age conceived the idea of making England independent of foreign countries for its supply of iron, he established himself as an iron merchant at Gosport, Hampshire, and in 1775 erected ironworks at Fontley, near Gosport. There he expended large sums on the development of processes for improving and increasing the production of iron. During 1783

and 1784 he perfected the first process which made use of grooved rolls for the removal of slag and a method of puddling iron that produced much greater quantities than had previously been possible. He took into partnership Adam Jellicoe, chief clerk in the office of the paymaster of the navy, but after his partner's death the navy board seized his ironworks for claims against Jellicoe, involving Cort in lawsuits and eventually in total ruin. After his death, his family received insignificant pensions from the government. He is sometimes called "the father of the iron trade," and his inventions contributed much to England's industrial greatness in the 19th century.

CORTE, kôr'tâ, town, Corsica, on the Tavignano River, 35 miles northeast of Ajaccio. Picturesquely situated among the mountains, the town is partly built on a steep rock crowned by a 15th century citadel. It was the seat of the Corsican patriot Pasquale di Paoli's reform government from 1755 to 1769. An ancient palace from which Paoli ruled and an old Franciscan monastery which served as the parliament house in 1765 still remain. Corte produces lumber, wine, and briar pipestems. Pop. (1946) 5,089.

CORTE-REAL or **CORTERREAL**, kôr'tê-rê-âl, **Gaspar**, Portuguese explorer: b. about 1450; d. about 1501. In 1500 he was sent out by King Emanuel (Manuel I) in search of the Northwest Passage. Setting out from Lisbon, he ranged the shores of the country afterward called Canada. On his second voyage, in 1501, he sent back two ships but never returned himself. His brother Miguel, who sailed in search of him in 1502, was never afterward heard from. King Emanuel sent an expedition to learn their fate but in vain.

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CORTELYOU, kôr't'l-yō, **George Bruce**, American public official and business executive: b. New York, N. Y., July 26, 1862; d. Huntington Bay, Long Island, Oct. 23, 1940. After being graduated from the State Normal School, Westfield, Mass., in 1882, he taught school in New York City and entered public service in 1889, serving as assistant to several New York and federal officials. In 1895, he received the degree of bachelor of laws from Georgetown University, Washington, D.C., and in the same year became stenographer to President Cleveland. In 1900 he was appointed secretary to President McKinley, and President Theodore Roosevelt continued him in that office until 1903, when he became first secretary of the Department of Commerce and Labor. Under President Roosevelt he also served as postmaster general (1905-1907) and as secretary of the treasury (1907-1909). He left government service in 1909 and was president of the Consolidated Gas Company of New York until 1935.

CORTES, kôr-täs', **Hernán**, ěr-nân' (also **HERNANDO** or **FERNANDO CORTEZ**), Spanish conqueror of Mexico: b. Medellín, Extremadura, Spain, 1485; d. Castilleja de la Cuesta, near Seville, Spain, Sept. 2, 1547. A descendant of the country's minor nobility, he was sent in 1499 to the University of Salamanca to study law. After two years of irregular studies he decided to seek a life of adventure and planned to participate in a

military expedition to Italy, but had to stay behind on account of a sudden illness. Upon his recovery he set out, in 1504, for Hispaniola (Santo Domingo) in the West Indies, where he assisted his kinsman, Nicolás de Ovando, in several campaigns against the Indians. In 1511 he joined Diego Velázquez in the conquest of Cuba and was named by the latter mayor of the recently founded city of Santiago de Cuba.

When Velázquez got news of Juan de Grijalva's successful exploration of Yucatán, he entrusted Cortés with the conquest of Mexico. Later, however, he reversed the commission. Disregarding the orders of the governor, Cortés set sail from Santiago in February 1519 with a fleet of 11 vessels, manned by about 700 Spaniards and armed with 10 small field pieces. With him he took 18 horses which proved of inestimable value, since these animals were then unknown to the Indians of America. Following in the footsteps of Grijalva he landed first off Yucatán and then reached Tabasco, where the natives gave him 20 slave girls. One of these maidens was the beautiful Malinche (renamed Marina) who spoke several native languages and who bore him a son. After having built the fortified port of Villa Rica de Vera Cruz (today Veracruz), he established there his own government independent of Velázquez, appointed himself captain general, and, to give his soldiers the courage of despair, caused his little fleet to be destroyed. Then he began his conquest of the extensive Aztec empire of Anáhuac or Mexico.

The sight of mounted, ironclad white men and the noise of their cannons alarmed and stupefied the natives. The adventurer quickly defeated the Tlaxcalans, the perennial enemies of the Aztecs, and the Tlaxcalans became his faithful allies to the last. After avoiding a trap at Cholula, Cortés entered the city of Mexico, then called Tenochtitlán, on Nov. 18, 1519. Montezuma II, the sovereign of the country, received him graciously, and the inhabitants, recalling the legend of the return of the white god Quetzalcoatl, thought him a divinity and a child of the sun. Cortés did nothing to dispel these illusions. Instead he demolished the idols in the temples and replaced them with images of the Virgin and the saints. In the meantime he made continual progress toward getting possession of the country, forming alliances with several caciques (chieftains) who were enemies of Montezuma. When he received notice that an Indian force, in obedience to a secret order by Montezuma, had attacked Veracruz and sent the head of a Spanish warrior to the capital to prove the white man's mortality, Cortés repaired to the imperial palace, had the commander and officers of the offending Indian expedition burned alive, and compelled the emperor, in chains, to acknowledge publicly the sovereignty of Charles V of Spain. The unhappy monarch had to add to his homage a large quantity of pure gold and a number of precious stones.

Early in 1520 Velázquez, jealous of the successes of his insubordinate representative, sent against him a detachment of about 1,000 men led by Pánfilo de Narváez. These were immediately won over by Cortés who had hastened to the coast to meet them, leaving Pedro de Alvarado in command at Tenochtitlán. The latter's cruel regime led to an open revolt of the Aztecs, and Montezuma, who attempted to restore tranquillity by showing himself to the multitude, fell a victim to their wrath. Cuauhtemoc (Guatemotzin), his

nephew and son-in-law, was acknowledged as emperor by the Mexicans. Under his leadership fighting continued after the conqueror's return to Tenochtitlán. On the famous *noche triste* (dismal night), June 30, 1520, Cortés had to abandon the city. However, a decisive victory over the Mexicans at Otumba soon after restored his hold, and after a three-month siege he again took possession of the capital (Aug. 13, 1521), which was laid in ruins and later rebuilt as a Spanish city. Cuauhtemoc and a great number of his nobles were subjected to torture and later executed. The subjection of the rest of the empire proved an easy task. The infamous *repartimiento* system was inaugurated, and the Indian population was treated little better than slaves. Cortés undertook several expeditions to remote parts of Mexico, then called the Viceroyalty of New Spain, and penetrated as far as Honduras.

The court of Madrid, lending an ear to the charges of his rivals, now became suspicious of the power of Cortés who had some time before been appointed captain general and governor of New Spain. To clear himself, Cortés went to Spain. During his stay there (1528–1530) he was received with much distinction by Charles V and named marqués del Valle de Oaxaca, and he returned to Mexico with an increase in titles, but a diminution of power. The viceroy had charge of civil administration, while Cortés was entrusted only with the military command and the privilege of pursuing his discoveries. Though he discovered (1536) the peninsula of Lower California and the intervening Gulf of California, most of his enterprises were frustrated, particularly since the installation of the able Antonio de Mendoza as viceroy. Embittered, he returned in 1540 to Spain, where he was coldly received and neglected. He followed Charles V on his unfortunate expedition against Algiers in 1541 and gave signal proofs of his valor, yet the monarch continued to refuse him admission to the court. It is said that one day, when he forced his way through a crowd around the carriage of the king, and put his foot on the step to obtain an audience, Charles coldly inquired who he was. "I am a man," replied Cortés, "who has gained you more provinces than your father left you towns." He passed the remainder of his days lingering around the court in a vain effort to recover the sums he had spent out of his personal fortune in the New World. At his death he left a reputation as a great 16th century man of action, bold and able, but not lacking in cruelty and even perfidy. Buried in Seville, his remains were later brought to Mexico City. His natural son by Marina, called Don Martín Cortés, became a knight of the Order of Santiago.

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CORTES, kôr'tez, the old assembly of the "estates" in Spain and Portugal, the representa-

tives chosen by the three estates (nobility and clergy, to which were added the burghers in the 12th and 13th centuries) to assist the king in making and administering the laws. These parliaments seem to have grown out of the councils composed of nobles which advised the Visigoth kings. During the division of the Iberian Peninsula into various kingdoms, including Portugal, they exercised considerable power, which continued during the period of reconquest from the Moors. But following the territorial consolidation of Spain in the 15th century and the growth of royal supremacy in both Spain and Portugal, their power declined. The vast wealth of the Spanish and Portuguese colonies made the kings less dependent on the parliaments for subsidies, and they were summoned less and less frequently.

In Spain the Cortes of Castile, which was composed of the higher nobility, the superior ecclesiastics, the knights of the orders of Saint James, Calatrava, and Alcántara, and the representatives of certain cities, held the first rank during the time of the united Spanish monarchy. In early times the king was very dependent upon the Cortes; indeed, it was invested with the power of making war and frequently exercised it in opposition to the throne. In the original constitution of Aragon, where the Cortes was very powerful, a supreme judge, called the *justicia*, presided over the administration of the government. He decided all questions and disputes between the king and his subjects, and confined the royal power within the constitutional limits. King Ferdinand II of Aragon and Isabella of Castile succeeded in rendering themselves independent of the Cortes; and afterward, when the Castilians dared to resist an unconstitutional tax at a meeting convoked at Toledo by Charles V in 1538 the emperor abolished this assembly of the estates. After this neither the clergy nor nobility were assembled. Deputies from 18 cities were sometimes, however, convened, but this only in case subsidies were to be granted. Philip II restrained the liberties of the Aragonese in 1591. After the War of the Spanish Succession, Philip V deprived those provinces which had adhered to the anti-Bourbon party of the privileges that still remained to them. From that time the Cortes were convened only to pay homage to the king or the prince of Asturias, or when a question respecting the succession to the throne was to be determined.

The national Cortes elected in 1810 at Cádiz, in the only section of Spain then free from Napoleon, promulgated a liberal constitution on May 8, 1812, while the Anglo-Spanish liberation of the kingdom was still under way. Ferdinand VII, returning two years later, abrogated this constitution, and a period of monarchist reaction followed. Thereafter, with short intervals of power, notably during the chaos of the First Spanish Republic (1873-1874), the Cortes was under royal or military domination. A single-chamber Cortes was the parliament of the Second Spanish Republic (1931-1939). It was re-established by Francisco Franco in 1942, but was stripped of its powers under his dictatorship. See also SPAIN—*Government; History*.

Burghers were admitted to the Cortes of Portugal by King Diniz (r. 1279-1325). The medieval parliament held substantial power, due in part to its privilege of approving the succession to the throne, during a period marked by revolts and civil wars until the end of the 15th

century. The accession of John IV, following a period of Spanish rule (1580-1640), marks the decline of the Cortes, the last of the time being summoned in 1697.

As in Spain, the period following the Napoleonic Wars saw a struggle between liberals and reactionary monarchists. A Cortes briefly held considerable power, 1820-1823, and another, 1826-1828, when absolutism was reinstated by Don Miguel.

The National Assembly of Portugal, established along corporative lines in 1933 under the dictatorship of Antonio de Oliveira Salazar, is the Cortes Gerais. See also PORTUGAL—*History*.

CORTEX, a protective layer of tissue occurring in the stems of dicotyledonous plants, situated between the pericycle outside the phloem and the epidermis. The name has been applied loosely to any outer layer of stem tissue, but it is better usage to restrict it to primary cells and the tissues developed therefrom.

Cortical tissues often are a conspicuous part of bast, which is of economic importance in vegetable fibers and textiles. See also BAST.

CORTEZ, kôr'têz, town, Colorado; seat of Montezuma County; altitude 6,198 feet; 210 miles southwest of Colorado Springs. It is five miles northwest of Mesa Verde National Park, in a region producing cattle, sheep, dairy products, and timber. The Consolidated Ute Indian Reservation is nearby.

Settled in 1887 and incorporated in 1902, Cortez has government by mayor and council. Pop. (1950) 2,680.

CORTHELL, Elmer Lawrence, American engineer: b. South Abington (now Whitman), Mass., Sept. 30, 1840; d. Albany, N. Y., May 16, 1916. When he was in his second year at Brown University the Civil War broke out and he enlisted in the First Regiment, Rhode Island Light Artillery, rising from private to captain during the war. Then he re-entered Brown, obtaining successfully the degrees of B.A., M.A., and in 1894 Sc.D. He took up engineering work, mainly in the Mississippi Valley. After engaging in railroad and bridge construction requiring great skill, he was associated in 1875 with James B. Eads in building the jetties at the mouth of the Mississippi River. Among the many engineering projects in which he participated were the planning with Captain Eads of the ship railway across the Isthmus of Tehuantepec; the building of several large bridges over the Missouri, Ohio and other rivers; the opening of the Amazon River and the designing of the harbor works at Tampico, which raised that port to the first rank in Mexico.

CORTINA, kôr-tê'nâ, Juan Nepomuceno, Mexican adventurer: b. Camargo, Tamaulipas, 1830; d. Azcapotzalco, Federal District, Oct. 30, 1894. He took an active part in the war between Mexico and the United States, organizing a band of independent guerrillas, which later became a part of the national army, and with their commander took part in many of the battles of that contest. After the war he became a general in some of the revolutionary risings, and in 1859 set himself up as an independent ruler along the border line between the United States and Mexico, where he held sway from 1859 until 1863. He became an adherent of the unfortunate

can, and from 1861 to 1864 he was United States minister to Mexico.

CORY, William Johnson (original surname JOHNSON), English schoolmaster and lyric poet: b. Torrington, Devonshire, 1823; d. Hampstead, June 11, 1892. He was a master at Eton (where he had been educated) from 1845 until 1872; in the latter year, having inherited an estate, he assumed the name of Cory. In 1858 he published *Ionica*, a volume of poems containing a notable translation of the epitaph on Heraclitus by the Alexandrian poet Callimachus—"They told me, Heraclitus, they told me you were dead." Other works included *Lucretius* (1871), on the writing of Latin verse; and a *Guide to Modern History from 1815 to 1835* (1882). F. Warre-Cornish edited his *Letters and Journals* (1897).

CORYATE, kōr'i-āt, or **CORYAT**, **Thomas**, English traveler: b. Odcombe, Somersetshire, 1577?; d. Surat, India, Dec. 1617. He was a willing buffoon at the court of James I, and later was a member of the household of Prince Henry, the king's eldest son. During five months in 1608 he traveled, mostly on foot, through much of western Europe, and recounted his experiences in *Coryat's Crudities* (1611), a curious book to which, on the orders of Prince Henry, were appended quizzical verses, in various ancient and modern languages, written by Ben Jonson, John Donne, and other authors. The latter were afterward published separately under the title of *The Odcombe Banquet*, with a preface reflecting satirically upon Coryat. In a second volume, entitled *Crambe or Colwort Twice Sodden*, he protested that the verses were appended to his original work without his consent. He departed on his second journey in 1612, residing for a time at Constantinople, visiting Palestine and Mesopotamia, and reaching Agra, in India, in 1616. In 1905 Glasgow University Press republished *Coryat's Crudities*, with his letters from India.

CORYBANT, kōr'i-bānt, in Greek mythology, one of the beings said to have sprung from Corybas, son of Cybele and Iasion, who appointed them to perform religious service for his mother, the goddess Cybele, in Crete and Phrygia. The Corybantes engaged in wild religious dances to the accompaniment of the music of flutes and cymbals. There were also Corybantes who were regarded as a class of deities resembling the Cabeiri (q.v.), and of whom little is known. According to ancient traditions, they were descendants of Hephaestus (Vulcan). The name is sometimes given to the priests of Cybele, as it was said they imitated the dance of the Corybantes.

CORYDALIS, kō-rīd'ā-līs, a genus of large insects, whose net-veined wings expand nearly six inches. It is a member of the neuropterous family Sialidae, and is named *Corydalus cornutus* in allusion to the enormously long hornlike mandibles of the male, used as claspers in the act of pairing, those of the female being large, but short, broad, and toothed. The larva is called in the northern part of the United States dobson or hellgramite, and among the Mississippi fishermen it is known as crawler; it is much esteemed as bait. The larva lives for nearly three years under stones in brooks; it is nearly three inches

long, with six legs and big jaws, and along each side of the hind-body is a series of long filamentary appendages, at the base of which are short bushy or spongy gills. It breathes by the spiracle during its later larval life, when it lives out of the water. It transforms into a chrysalis in the earth on the banks of brooks. The female lays from 2,000 to 3,000 eggs in a mass. Though very ferocious in appearance, the insect, which sometimes alights on one's dress, is entirely harmless.

CORYDON, kōr'i-d'n, town, Indiana, seat of Harrison County, located on Indian Creek 18 miles west-southwest of New Albany. It is served by the Louisville, New Albany and Corydon Railroad. A sulphur spring here and Wyandotte Caves near by attract tourists. Furniture and cheese are made here. Corydon was the capital of Indiana Territory in 1813-1816 and of the state in 1816-1825. The old capitol building still stands. In 1863, during the American Civil War, John Hunt Morgan's raiders attacked a small Federal force here. Pop. (1930) 2,009; (1940) 1,865; (1950) 1,964.

CORYDON, town, Iowa, seat of Wayne County, 58 miles south-southeast of Des Moines. It is served by the Chicago, Rock Island and Pacific and the Chicago, Burlington and Quincy railroads. It is the shipping center for a large timothy seed producing area; and has a hatchery and an automobile battery factory. There are coal mines in the vicinity. Corydon was incorporated in 1867. Pop. (1940) 1,872; (1950) 1,858.

CORYMB, kōr'ĩmb, in botany, a simple, flat-topped or convex flower cluster with a single axis, the outermost flowers, with the longest stalks, originating farthest down on the axis, and opening first; flowers nearer the center located progressively higher, and shorter stalked; as in hawthorn.

CORYMBUS, in ancient sculpture, the wreath of ivy leaves, berries, or garlands with which vases were encircled. The term is also applied to that style of dressing the hair among the Grecian women, in which it was tied in a knot on the top of the head. The Venus de Medici represents the simplest form of this headdress.

CORYPHEA, kōr-i-fē'ná, a genus of fishes of the family Coryphaenidae, related to the mackerels. The body is elongated, compressed, and covered with small scales, and the dorsal fin extends the whole length of the back, or nearly so. The dolphin of the ancients is the *C. hippuris*. All the species, natives of the seas of warm climates, are very rapid in their motions, and very voracious. They are of brilliant colors and are objects of admiration to every voyager.

CORYPHEUS, kōr-i-fē'ūs, the leader of the chorus in the ancient Greek dramas. His functions, however, were often as wide as those of our stage manager, conductor, and ballet master. The name is now applied to the leaders of the different parts in operatic choruses, or the principal dancers in the *corps de ballet*. By extension, it is also applied to those eminent in the arts or sciences.

COS. See **Kos.**

COSEGUINA, kō-sâ-gwē'nā, volcano, Nicaragua, on a peninsula south of the Gulf of Fonseca. Cone shaped, the mountain is 3,830 feet high. A devastating eruption occurred in 1835.

COSEL. See **Kőzle**.

COSELEY, kōz'li, town, England, in Staffordshire, 8 miles northwest of Birmingham. It lies within the parliamentary boundaries of the county borough of Wolverhampton. There are iron foundries, nail, hook, chain, and screw works, grate manufactories, cement works, and brickfields. In the vicinity are extensive iron and coal mines. Pop. (1951) 34,414.

COSENZA, kō-zēn'tsä, city and commune of Italy, in Calabria, the capital of Cosenza Province and seat of an archbishop, lying on the slopes of the Sila Mountains, at the confluence of the Crati and Busento rivers. The ancient city, with its narrow, winding streets, is built on a steep hill crowned by a medieval castle, but other, partly modern, sections have spread to nearby heights. The 12th-century cathedral has the fine tomb of Isabella of Aragon. There is an academy of science and fine arts founded in the 16th-century. Ancient *Cosentia* was a leading town of the Bruttii. The Visigothic king Alaric II was supposedly buried here in the Busento River in 410. The city, which went through periods of comparative prosperity and longer ones of decline, has now added some industrial activities to its traditional ones as the agricultural trading and cultural center of the province (area 2,566 square miles; pop. 685,572). Its chief products are cereals, olive oil, fruit, and raw silk. Pop. of the commune (1951) 56,292.

COSGRAVE, William Thomas, Irish statesman: b. Dublin, 1880. After attending the schools of the Christian Brothers he entered on a business career in Dublin. He became prominent in the civic life of the city, and from 1909 till 1922 served as a member of the Dublin Corporation. An early supporter of the Sinn Féin movement, he took part in the Easter rising of 1916. After the amnesty in 1917 he was elected as a Sinn Féin to a seat in the British Parliament for Kilkenny City, and in 1918 he was re-elected for North Kilkenny. Meanwhile, in 1917 he became minister for local government in the Dail Eireann, and he continued to hold that post when the provisional government was formed in January 1922. From 1922 to 1927 he sat in the Dail Eireann as member for counties Carlow and Kilkenny, and thereafter for Cork. During August 1922 he was chairman of the provisional government, and from September to December of that year he was president of Dail Eireann. From 1922 until 1932 he served as president of the executive council of the Irish Free State, in that capacity proving himself an able administrator. With the victory of Eamon de Valera's party at the polls in 1932 he vacated office, and until his retirement from political life in 1944 he was leader of the opposition.

COSHOCTON, kō-shōk'tūn, city, Ohio, seat of Coshocton County, located on the Muskingum River 25 miles north of Zanesville. It is served by the Pennsylvania and the Wheeling

and Lake Erie railroads. Manufactures include enamelware, pottery products, and advertising novelties. Here, in 1764, Henry Bouquet (q.v.) made a treaty that ended the rebellion under Pontiac. An Indian village on the site was destroyed in 1781. The place was known as Tuscarawas until 1811, when it was made the county seat. Pop. (1950) 11,626.

COSMATI, kōz-mä'tè, name of a family of architects, sculptors, and mosaic workers who flourished in Rome from the last half of the 12th century to the beginning of the 14th. Prominent members of the family comprised Lorenzo (2d half of 12th century), Jacopo (fl. 1205-1210), Cosimo (fl. 1210-1235), Luca (fl. 1231-1235), Jacopo (fl. 1231-1293), Adeodato (fl. 1294), and Giovanni (fl. 1296-1303). They won their fame by their decorative architectural work, known as Cosmati or Roman work, distinguished by the use of mosaic and colored marbles.

COSMETICS, substances and preparations, not including soap, that are applied to the human body for cleansing, beautifying, promoting attractiveness, or altering the appearance. In the United States retail sales of such articles are approaching \$1 billion annually. The consumer is protected against dangerous substances and misrepresentations by the provisions of the Federal Food, Drug and Cosmetic Act and the regulatory powers of the Federal Trade Commission. In addition, the Council on Cosmetics of the American Medical Association reports on the quality of products and conducts public educational programs.

Cosmetic creams are used for cleansing, lubrication, or softening, and as a foundation for makeup. Modern cold creams consist chiefly of mineral oil, beeswax, and spermaceti emulsified with water, borax, and some perfume. Inclusion of synthetic waxes produces a fluffier cream. Emollient creams often contain an animal fat such as lanolin or cholesterol. Vanishing creams consist of a stearic-acid soap emulsified with glycerol and water, often supplemented with various oils and synthetic hydrophilic substances. Many special-purpose creams are also available. Bleaching creams contain ammoniated mercury, hydrogen peroxide, or sodium perborate, and may be irritating. Astringent creams contain zinc compounds or alum or related substances. Authorities are still reserving judgment as to the advisability of using creams containing estrogenic hormones. Very small amounts are present in most preparations available and it is unlikely that favorable local effects are produced on human skin.

Hand lotions most often consist of an emulsion of soap, oil, glycerin, and a gum such as mucilage of quince seed. Many other ingredients are present in specific preparations. Hand creams generally resemble vanishing creams and some hand lotions may be prepared in a similar manner with a higher percentage of water to render them liquid. Hand lotions function to absorb superficial moisture and form a thin protective coating over the skin which keeps it soft and helps prevent chapping.

Face powder consists almost exclusively of mineral products, the most important of which is talc. Other components are magnesium carbonate, kaolin, chalk, magnesium stearate, zinc stearate, zinc oxide, titanium oxide, and rice

starch. The coloring agents are usually ochers and sienna or certified organic dyes. Careful blending and adjustment of particle size are necessary to assure proper covering power, adherence, sheen, ease of spreading, and color.

Cake make-up to be used instead of or with face powder is made in the same manner as face powder with the addition of a fat or oil and an emulsifying agent. It is applied with a wet applicator.

Rouge is sold in cream, paste, and powder forms. Powder rouges are usually pressed into cakes and are essentially the same as face powder with the addition of a binder and coloring matter. Cream rouge contains pigment in a cosmetic cream base and paste rouge consists of colors, fats, and waxes.

Lipsticks contain primarily an oil, a wax, and coloring materials. Castor oil has been extensively used but fatty acid esters of glycerol and glycol are often substituted. The wax is usually beeswax, paraffin, carnauba wax, or spermaceti. Tetrabromofluorescein, called bromo acid, is the most common coloring material, but colored lakes or salts of organic dyes are also employed. The product is carefully blended for consistency, softening point, ease of application, and ability to stay for several hours. Small amounts of flavoring agents and perfumes are also added.

Nail lacquers are similar to other lacquers in that they consist chiefly of nitrocellulose dissolved in a suitable solvent such as ethyl acetate and butyl acetate. A softener or plasticizer is added to prevent brittleness and a resin to improve adhesiveness. The dyes are usually organic lakes. Nail polish removers consist of similar solvents or acetone and plasticizer. Cuticle removers are alkali solutions.

The most important hair preparations are shampoos, dyes, and permanent wave solutions. Most shampoos are soaps prepared from coconut, palm, almond, or olive oils. Recently many synthetic detergents have also been employed as soapless shampoos. Three types of hair dyes are employed. Natural vegetable dyes such as henna or walnut extract are harmless but sometimes make the hair stiff and interfere with permanent waving. Metallic dyes are also harsh and may irritate the skin. Synthetic organic dyes are now most widely used because they are easy to apply and produce pleasing results. A certain number of individuals are allergic to such substances, and the Federal Food, Drug and Cosmetic Act requires that such preparations include directions for a preliminary test. Some so-called hair tints are actually dyes. Other hair tints and rinses contain water soluble dyes which have no permanent effect on the hair. Cold wave preparations contain reducing agents, such as thioglycolate salts, which accomplish partial degradation of the hair.

Antiperspirants decrease the flow of perspiration. They usually contain aluminum compounds. Deodorants do not prevent formation of perspiration but prevent decomposition with subsequent odor. Numerous antiseptic substances, such as hexachlorophene, are used for this purpose. See also FEDERAL FOOD, DRUG AND COSMETIC ACT; PERFUMES AND PERFUMERY.

A. EARL VIVINO, M.D.,
Medical Director of Health Service, Georgetown University Medical Center.

COSMIC DUST. See **DUST.**

COSMIC RADIATION, a term which describes a high-energy, penetrating radiation which impinges upon the earth and has its origin in outer space or in the cosmos. The primary radiation is today known to consist of charged particles, mostly protons, and a few heavier nuclear particles. The term "cosmic rays" is synonymous. The word *ray* or *radiation* is used to describe streams of charged particles, in the same way that it is used in the terms "cathode rays" or "beta-rays," both of which terms refer to streams of electrons, or in the term "alpha ray," which means a stream of helium nuclei.

Cosmic radiation is detected and measured by any device or arrangement which measures ionizing radiation. There are today three main types of such detectors. First is the ionization chamber or counter. These counters, of which there are many types, including Geiger counters, proportional counters, neutron counters, scintillation counters, spark counters, crystal counters, and other varieties, all yield an electrical impulse when the particle to be detected passes through their sensitive volume. The electrical impulses can then be amplified, counted, and recorded or presented to an observer by a wide variety of electronic devices. The second type of detecting device is the cloud chamber. In this apparatus the track formed by the ionizing particle is made visible by allowing a "cloud" or a condensation of a liquid to take place along the track. This is accomplished by effecting an expansion in a saturated vapor immediately after the particle has passed. The track can be photographed, and the momentum of the particle can be measured by observing its curvature in a magnetic field. The third type of detecting device is the photographic emulsion. It has been known for a long time that ionizing particles passing through an emulsion will leave a developable track. Nuclear disintegrations and secondary-production phenomena can be studied in the emulsions as well.

Cosmic radiation was discovered in the early 1900's, when it was noted that a small amount of extremely penetrating radiation was residual after all radioactive substances had been removed or been adequately shielded from the radiation-measuring device. The conclusive experiment, performed by Victor Franz Hess of Austria, consisted of taking an ionization chamber up in a balloon flight. Hess interpreted the increased readings he obtained as he ascended by supposing that a penetrating radiation was incident upon the earth and was attenuated by atmospheric absorption, so that the intensity would be greater as the top of the atmosphere was approached. Hess further noted that there was no great difference between nighttime and daytime intensities, thus ruling out the sun as the probable source of the rays. The origin was therefore presumed to be beyond the solar system, and the adjective "cosmic" dates from this epoch.

It was at first supposed that the cosmic radiation was electromagnetic radiation, such as gamma rays or X-rays. However, the discovery of the latitude effect by J. Clay of Amsterdam in 1927 could lead only to the conclusion that the incoming rays were indeed streams of charged particles. Such charged particles would be deflected in the earth's magnetic field in a manner which would give rise to a latitude variation, whereas electromagnetic radiation would not be deflected and would not be expected to show a latitude dependence. The calculations of the trajectories

of particles of various energies were made by Fredrik Carl Mülertz Störmer in Norway and were later specifically applied to the cosmic ray problem by Abbé Georges Édouard Le Maitre of Belgium and M. S. Vallarta of Mexico. The world surveys of cosmic radiation carried out in the late 1920's and early 1930's by groups directed by Arthur H. Compton and Robert A. Millikan produced a picture of the world-wide distribution of the rays, and enabled the latitude effect to be studied in detail. Further, these surveys enabled estimates of the energy of the primary radiation to be made. Thus it was found that the primary rays had energies upwards of 2 billion electron volts. The average energies were found to be some 6 billion, and the presence of much higher energies was established. The maximum energies are not determinable by the latitude effect, but can be studied by a secondary generation process known as giant showers or Auger showers, named after Pierre Victor Auger of France. Such studies show the maximum energies in electron volts to be at least 1 followed by 16 zeros, and possibly to be 1 followed by 17 zeros. These energies per particle are very great, and today our most powerful accelerating machines can only duplicate the low-energy part of the radiation.

The complete analysis of the primary radiation has been carried out by the aid of photographic plates and counters carried to high altitudes in balloons and rockets. The results of this analysis, containing the contributions of observers from many nations, is that the primary rays are mostly protons, with a few alpha particles and a still smaller number, representing perhaps a bit under 1 per cent of the whole, of heavier nuclei. Several observers have shown that electrons are almost entirely absent in the primary radiation. Gamma rays, or electromagnetic radiation, are also not present as an important constituent of the primary radiation. Thus we may consider the primary rays to be, by numbers of entities, some 92 per cent protons, 7.5 per cent alpha particles, and about 0.5 per cent heavier nuclei. It is expected that more exact figures will be available during the next few years.

The number of such rays arriving at the top of the earth's atmosphere is around 0.34 per square centimeter per second, or about 2.2 per square inch per second, arriving in latitudes near the poles. The number at lower latitudes is substantially less. The total energy arriving at the earth in the form of cosmic radiation is approximately equal to that of starlight. No daily variation, sidereal time variation, or seasonal variation in the primary flux as large as 0.2 per cent has been found, so that the rays can be thought of as being uniformly distributed and coming equally from all points in space. Important correlations with meteorological variables such as temperature and pressure are to be expected and are found, since for example the pressure is a measure of the amount of absorbing matter in the atmosphere above the observer. The uniform intensities cited are intensities measured after corrections for temperature and pressure have been made.

Irregular variations and variations in the primary radiation which can be correlated with magnetic storms and with solar disturbances have been found. The magnetic storm effect occurs when sudden variations (storms) in the earth's magnetic field alter the amount of deflection

which the arriving radiation experiences. The correlation with solar disturbances are the result of quite complex phenomena, in which streams of charged particles are emitted from disturbed areas on the sun's surface. This study is in its infancy, and it may be presumed that the next few years will teach us many new facts about the rather complicated correlations.

The cosmic radiation, when it is incident upon the atoms and molecules in the upper atmosphere, produces a whole variety of secondary radiation, among which secondaries are found all particles known to science. A number of new particles were first discovered in the cosmic radiation. The positive electron, identical—except for the sign of its charge—with the normal negative electron, is a well-known secondary particle. So also are the various kinds of mesons or mesotrons, of which today 8 or 10 are known with some degree of certainty, and several other possible types are suspected. These particles may have charges of plus, minus, or zero in units of the electronic charge and masses which range from about 205 (μ mesons) or about 265 (π mesons) and up to higher figures, in terms of the electronic mass. In addition, V-particles are known, the masses of which are greater than that of the proton. The various mesons have radioactive decay schemes, so that, for example, a π meson decays into a μ meson, and this in turn into an ordinary electron. The full story of meson physics is exceedingly complex and is being investigated at the present time (1953). Further, secondary nuclear particles are formed, including protons, alpha particles, deuterons, neutrons, and other nuclear fragments. The neutrons enter into nuclear reactions with surrounding matter and produce such radioactive substances as radiocarbon (carbon 14), and tritium (hydrogen 3). These substances have both been detected in the atmosphere, and are both usable as dating tools, since the time which has elapsed subsequent to their formation can be measured.

It should also be said that the only radiation which reaches sea level is the secondary radiation produced at high elevations. Virtually none of the primary particles survive the passage through the atmosphere, and the mesons are the main agency by which the radiation is propagated to sea level.

What effect cosmic radiation may have in biological problems has not yet been clearly established. It has been suggested that cosmic radiation may produce mutations, or that the effects may be important biologically at high elevations. However, good control experiments are difficult to perform, and conclusive evidence is still absent. The practical applications of the radiation at present are as a tool of research. The radiation permits us to learn more about the nature and the variations of the earth's magnetic field, gives us a new tool for high altitude meteorology, and provides a means for investigating the physics of high energy radiations. Since the current high-energy machines will only reach the lowest part of the cosmic ray energy spectrum, the radiation provides us with our only source of very high energy particles and quanta. Harnessing the radiation, with the implied use for power, is evidently not a fruitful endeavor, because of the small number of cosmic ray particles.

The origin of the cosmic radiation is not at present understood. It is, however, known that cosmic ray energies are so great that they could

not originate in a nuclear process, and must therefore have their origin in a large-scale magnetic field which varies with time. Enrico Fermi proposed a mechanism in which magnetic fields in the galaxy, due to photo-ionized interstellar dust clouds moving in irregular paths, can experience inelastic collisions with particles and accelerate some of the particles to very high energies. The mechanism implies that the particles are injected at a moderate energy, and are then accelerated by the fields. Other theories have been proposed by other physicists and astronomers, but to date all except Fermi's have difficulty in accounting for the total amount of energy. Fermi's theory also recognizes the absence of much or any radiation with energy below 2 billion volts, and the absence of electrons, since the absorption effects will be high for both the electrons and the low-energy protons. The exact nature of the injection mechanism has not as yet been explained. Abbé Le Maitre has suggested that the cosmic radiation is left over from the creation of the universe. If this theory is correct, no acceleration mechanism is required. The previously mentioned absorption effects will, as before, remove the electrons and low-energy protons from the primary radiation.

SERGE A. KORFF,

Professor of Physics, New York University.

COSMOGONY, the term generally used to cover the theories concerning the origin and development of the bodies or groups of bodies found in space. Such hypotheses originally were entirely fanciful and represented only processes their originators *thought* had taken place. Since the days of Sir Isaac Newton (1642-1727), when at least some of the physical laws have become known, these hypotheses represent scientific attempts to explain the origin and evolutionary processes of the universe in accord with natural laws. While observational astronomy gives us the picture of the universe as it is today and the momentary changes that are taking place, cosmogony seeks to project this knowledge into both past and future.

The creation myths of primitive peoples are unscientific attempts at cosmogony. The account of creation in Genesis is an excellent allegorical outline, the strong evolutionary tendency of which is usually overlooked. The Hebrews undoubtedly derived it from earlier and cruder ideas prevalent in the Euphrates Valley. The early Greeks, with their vivid imaginations, had various legends describing how things in heaven and on the Earth below were created by the gods, but Thales of Miletus (604?-546 B.C.) taught the first consistent theory. An immense intellectual step was made when Aristarchus of Samos (about 270 B.C.) dared to teach that the Earth not only rotates on its axis daily but revolves annually around the Sun. This correct conception was, however, too advanced for his contemporaries, or, for that matter, for men during the next 18 centuries. Therefore, the great Greek astronomers, Hipparchus and Ptolemy (Claudius Ptolemaeus), the latter of the 2nd century A.D., and others held to the older conception of a central, fixed Earth and revolving heavens. Nevertheless, their work was the basis of modern astronomy. We should add that the eminent philosophers Plato (427?-347 B.C.) and Aristotle (384-322 B.C.) both turned to cosmological questions. Their erroneous conclusions came from too little attempt at actual ob-

servations to test their theories and from the fact that few physical laws were known in their day.

Nebular Hypothesis.—The revival of the heliocentric theory by Copernicus (1473-1543), followed by the application of the telescope to astronomy by Galileo (1564-1642), and the physical laws deduced by him and by Johannes Kepler (1571-1630), all laid the foundation for Sir Isaac Newton's unrivaled work. Once this had appeared and it was inferred that gravitation acted throughout all space, the foundation for scientific progress in cosmogony was possible. Under some form a nebular hypothesis was outlined by Emanuel Swedenborg (1688-1772); by Thomas Wright (1711-1786); and by Immanuel Kant (1724-1804). Meantime the observations of Sir William Herschel (1738-1822) had given a far better basis for speculations about nebulae, so that when Pierre Simon de Laplace (1749-1827) outlined in 1796 what is now known as the *nebular hypothesis*, he was on far safer ground than his predecessors. His hypothesis resembles Kant's, but it is believed that Laplace did not know of this earlier work.

As Laplace's hypothesis exercised such an immense influence upon all scientific thought, and as certain of his general ideas are applicable today in studies of the spiral nebulae, it is described at some length. In outline, it called for the original nebula from which the system was formed to extend beyond the orbit of the farthest planet known at that time, namely Uranus. This nebula was believed to be one vast, tenuous, hot, and slowly rotating mass, which as it contracted under the control of its own gravitation gradually cooled. Its form would become first spheroidal, then more and more elliptical as its rotation became faster. With further cooling, this rate continued to increase since the total moment of momentum remained constant. After a time, when the equatorial centrifugal acceleration would slightly surpass the gravitational attraction, a ring of nebulous matter would be left. The remainder would continue to contract, until the same thing happened again, and so on until there was a ring for each of the seven known planets. As such a ring could not have perfect uniformity, it was believed to break eventually at some point and close up on itself, forming a nebulous mass—namely an embryonic planet. This planetary mass, following the same procedure when large enough, left off rings which coalesced to form satellites, though in Saturn's case the ring survived. What was left finally contracted into the present Sun.

It will be seen that this theory at a first glance has many good aspects. It is only just, however, to repeat Laplace's words on presenting it: he advanced it "with that distrust which everything ought to inspire that is not a result of observation and calculation." The apparent good points, in view of the *then known* facts, were: (1) planets revolved about the Sun in one direction; (2) planets and Sun rotated on their axes in this same direction; (3) planets' orbits were nearly in the same plane, and nearly circular; (4) satellites revolved about their planets in the same direction the planets rotated, their orbits also being nearly circular and near the plane of the planet's equator; (5) outer planets would be larger and have more satellites. When Hermann L. F. von Helmholtz's contraction theory of the solar heat was put forth in 1854 (see SUN), the necessity for a hot initial nebula was removed,

and reason given for expecting contraction. However, the time required for contraction was only about 25 million years, which was totally inadequate for the needs of geology, as by the latter part of the 19th century it was well known that the Earth was at least many hundred million years old. By 1900, however, the reasons against the nebular hypothesis had grown to such proportions that it had to be discarded. Some of these reasons are: the orbits should be more circular and less inclined than they are; the Sun's equator should be in, not 8° from, the average plane of the orbits; the orbits of the asteroids in many cases are inconsistent with the hypothesis; retrograde satellites flatly contradict it (unless they are captured bodies); rings could not be left as postulated; even if a ring were left, it could not condense into any *one* planet; and finally, the moment of momentum of the present system is far too small.

Meantime the special case of the Earth-Moon system had received attention, especially through the work of Sir George Howard Darwin in 1878-1882. This system is the only one known where the satellite has so large a relative mass, namely about 1:81 that of its primary. According to Darwin, the two formed a single body, which rotated in five hours. This rapid rotation produced unstable equilibrium, and the Moon broke off due to the solar tidal forces. Once there were the two bodies, they revolved about their common center of gravity and rotated on their axes. Each then raised great tides upon the other, and in time these plus solar tides would result in pushing the two bodies apart, and keeping the same face of the Moon turned toward the Earth. Looking forward in time, the day would increase in length faster than the month, and would become equal at 50 or 60 of the present days. Finally the solar tides would bring the Moon back to the Earth, and they would again unite. Despite the masterly mathematical treatment of the problem, there were so many assumptions, a small change in which would modify the conclusions, that it is probably unsafe to accept the theory as representing certain events to come. Yet tidal theory is important in our system.

Planetesimal Hypothesis.—In 1900 the Laplacian hypothesis was subjected to a critical investigation by Forest Ray Moulton and Thomas Chamberlain. They concluded the hypothesis was untenable and this led to their advancing what is usually called the *planetesimal hypothesis*. This theory appeared in fairly complete form by 1905. In its original form the theory started with a spiral nebula already formed around the Sun. James Edward Keeler at Lick Observatory had but recently published his classical work on nebulae, showing that spirals existed by tens of thousands, while in no case could a Laplacian nebula be detected. We also must remember that early in the 20th century we had no idea of what spiral nebulae were, nor of their distances. It is further to be noted that, at first, the origin of the spiral itself was largely ignored, though it was suggested that the tidal effects of another star, passing near the Sun, was the cause. When the nature of spirals and their sizes were finally determined, it was seen that they were too immense to form so small a thing as the solar system.

The final form of the hypothesis is as follows: In the remote past two stars, one of which was the Sun and the other we will call *X*, approached

one another moving in orbits which were certainly hyperbolic. Just how close their passage was is uncertain, but from 5 to 10 solar radii may be about correct. The time the bodies spent near together was very brief indeed. Each body produced tides upon the other, which grew to greater heights the nearer the bodies came. Here it should be noted that presumably everything that happened to the Sun also happened to *X*, and therefore two systems should have been formed simultaneously. This apparent fact is ignored in most discussions of the subject. Finally when the two bodies were nearest, the tidal strain—plus whatever internal forces of expansion were present—was great enough to tear off bodily the upper parts of the two tidal bulges and throw these masses of hot gases out into space. The hypothesis, however, was not limited to a single ejection; more probably there were several. But for the continued gravitational attraction of *X*, all the ejected material which had less than parabolic velocity would eventually have fallen back into the Sun. However, as *X* was moving in the counterclockwise direction, all such material was given a strong component in the direction *X* was going, and would thereafter revolve about the Sun in orbits with it as a focus.

Once the two stars had separated, the region around the Sun would be filled with debris from the encounter, torn not only from it but mingled with what had come from *X*. This would be mostly in the plane defined by Sun's center and containing the orbit of *X*, though smaller quantities could also be in other planes as well. Some of the slower moving material fell back into the Sun, producing the equatorial acceleration. Much of the remainder solidified promptly into planetesimals, which from the first were more crowded in certain localities, and which varied greatly in mass. All the original orbits would be very eccentric: they were made more circular as the planetary nuclei, pushing their way through the crowd of smaller debris, picked up large quantities of it, thus increasing their own masses. The same could be said for satellite nuclei. Further, we would expect the more massive planets to have more circular orbits and also to have much lower densities, since a body of Jupiter's mass probably from the first could retain its hydrogen and other light gases, but not one of the mass of Mercury or the Moon. In these latter cases the lighter gases would diffuse away into space, leaving only the heavier ones to be incorporated into the completed volume of the bodies in question. The facts that the solar equator is inclined to the average plane of the planetary orbits, and that these latter are themselves not in one plane, are satisfactorily explained.

Tidal Hypothesis.—The *tidal hypothesis*, developed by Sir James H. Jeans and Harold Jeffreys, appeared first in 1918, and, essentially, seems a mere corollary of the planetesimal hypothesis. In this, star *X* is supposed to have drawn from the Sun a cigar-shaped filament, densest near the middle part. Jeffreys afterward substituted the hypothesis that *X* actually had a grazing collision with the Sun.

Controversial Points.—The great stumbling block, as criticism has shown, is that such an encounter as postulated in the two preceding theories gives, under the most favorable circumstances, only one tenth the angular momentum we now find possessed by the planets. This was pointed out by Henry Norris Russell, who then

As a form of mythology, the accounts given of the universe were essentially imaginative cosmogonies, attempts to describe how the universe, as it was found, came into existence. Generally speaking, the patterns adopted were borrowed by analogy from the ordinary and familiar range of human experience, particularly from craftsmanship or the process of biological birth and development. The cosmogonic myths, frequently associated in primitive religions with ritual and serving in part to rationalize the latter, were thus of a creational or of an evolutionary type.

Philosophy, which itself in its very earliest appearance undertook to transform and rationalize many such myths, provides many examples of attempts to interpret the universe in its physical aspects as parts of an inclusive, systematic account of reality as a whole. An influential tradition, still adhered to in scholastic philosophy, assigned to cosmology the study of the universe in its material, spatial, and temporal features, largely with the aid of Aristotelian conceptual distinctions, as distinguished from ontology, the study of being as such. Such treatments, however, are generally of an a priori and dialectical character and thus are incapable of progressive development.

As a scientific discipline, by contrast, cosmology involves both the appeal to observation and to theory, where the latter undertakes to systematically organize, explain, and provide clues to observational research. The observable universe is, at present, identified in Edwin Powell Hubble's phrase with the "realm of the nebulae." These are in many cases identified as vast systems of stars, comparable to our own galaxy, the system of which our Sun and its planetary system are members. As explored by our most powerful telescopes, they are found to lie at enormous distances beyond the confines of our own galaxy. The furthest distance reached so far, with the 200-inch Mount Palomar instrument, is approximately 2 billion light years, and the results of such probing disclose at once an approximately uniform, homogeneous distribution of nebulae throughout space, and a red shift in their spectra. The latter has been commonly interpreted as indicating a mutual recessional motion of nebulae from one another, and therefore supports the idea of an "expanding universe."

Among the various approaches on the level of theory are to be found the use of general relativity theory, initiated by Albert Einstein himself in 1917 with a proposal for conceiving the universe as finite, unbounded, and static. This "model" has since been abandoned along with other early attempts, whereas current relativistic schemes involve in one form or another the idea of "expanding space." However, even here, there has not emerged as yet any fully satisfactory model. Meanwhile, a number of variant suggestions have been put forward, including those of Edward Arthur Milne (1896-1950), who employed a scheme of ideas called kinematic relativity, and in another direction, a view involving the appeal to "continuous creation" put forward by Hermann Bondi, Thomas Gold, and Fred Hoyle. See also CREATION; SOLAR SYSTEM; UNIVERSE.

MILTON K. MUNITZ,

Associate Professor of Philosophy, New York University.

COSMOS, a genus of about 12 species of showy, late-flowering annual or perennial herbs, mostly native in tropical America, belonging to the sunflower family (Compositae). Closely related to *Dahlia* and *Bidens*, *Cosmos* has opposite, pinnate leaves, heads solitary or in loose clusters on long stems, about three inches wide, with pink, red, or white flowers. Commonly cultivated are the perennial black cosmos (*C. atrosanguineus*),



Cosmos (Cosmos bipinnatus)

with a red disk and dark velvety-red rays; the tall annual *C. bipinnatus*, with yellow disk and white, pink, or crimson rays; the perennial *C. diversifolius*, with yellow disk and lilac or rose rays; and the tall annual yellow cosmos (*C. sulphureus*), with heads three inches across, yellow disk, and orange or golden-yellow rays. Easily grown from seeds, these plants are widely cultivated and make fine cut flowers.

COSSA, kôs'sä, **Francesco**, Italian painter: b. Ferrara, Italy, about 1436; d. Bologna, 1478. One of the leading painters of the school of Ferrara, Cossa is first recorded working there in 1456. In 1470, after finishing the series of frescoes begun by Cosimo Tura in the great hall of the Schifanoia Palace in Ferrara, he left for Bologna, dissatisfied with the payment he had received from Duke Borso Este. He remained in Bologna until his death. In his style Cossa draws from Piero della Francesca, who had worked in Ferrara, from Andrea Mantegna and from Cosimo Tura. At Ferrara, Tura and Cossa established one of the most distinguished of the smaller schools of Italian painting, a school characterized by a taste for mannered elegance and abstraction that blended well with the atmosphere of the princely court of the Estes. Cossa's ability to fashion an individual and impressive personal style from several sources of inspiration shows clearly in the Schifanoia Palace frescoes. Of his works in Bologna the most interesting was the altarpiece painted for the Grifoni Chapel in San Petronio. Though now scattered, a number of panels from this work have been preserved; particularly impressive are the statuesque figures in the three main panels representing St. Vincent Ferrer, now in London, and St. Peter and St. John the Baptist, now in Milan.

COSSA, **Pietro**, Italian dramatic poet: b. Rome, Italy, June 20, 1830; d. Leghorn, Aug. 30, 1881. Cossa went to South America after fighting for the abortive Roman republic in 1849. On his return to Rome he wrote a series of historical plays in verse, achieving his first and greatest success with *Nero* in 1871. Among those that followed were *Messalina* (1875), *Cleopatra* (1876), *Julian the Apostate*, *The Borgias*, some of these being staged by him but published after his death. Though written with considerable dramatic sense of character and situation, the plays

were often set against backgrounds which gave the author an opportunity to express his love of Rome and his faith in liberal and anticlerical ideas. In a sense his ideas and his success are offshoots of the Risorgimento and the unification of Italy.

COSSACKS, *kos'äk* (Russ. *Kozaks, Kazaks*), wild, warlike tribes of the USSR, who in czarist times lived in frontier regions of Russia and often rebelled against the czar, yet served as czarist irregular cavalry and finally as the old regime's security police. The name of Cossack is believed to be of Tatar or Turkish origin, and has been variously translated as "free laborer," "man of the frontier," and "freebooter." The national origin of the Cossacks is obscure, but they are believed to be of mixed Russian, Ukrainian, and Tatar lineage. In personal appearance, the Cossacks closely resemble Russians, but are more slender, and have more handsome and expressive features.

As early as the 16th century, Cossack settlements arose in the Ukrainian steppe lands along the Don and Dnieper rivers. Adventurers, runaways, and the discontented of all nearby nations created these settlements to live a free life, and escape injustice. In both river basins, these Cossacks formed highly militarized states, ruled by elected generals, or so-called hetmans. They lived the wild life of frontiersmen, fighting, farming, hunting, and trading, and soon acquired a reputation as great horsemen. Every economic depression or wave of czarist repression in Russia brought more hordes of runaways into the Cossack ranks. Gradually, Cossack settlements spread into the Kuban plain of north Caucasia, the lower Volga Valley, the south Ural steppe, western Siberia, and eventually even to the Russian Far East along the Chinese frontier.

For the early czars, the unruly Cossacks were both incorrigible rebels and invaluable allies. A Cossack named Ermak Timofeev led the first Russian expedition into Siberia in 1580, laying claim to that vast territory in the name of the czar. The entire Russian conquest of Siberia was spearheaded by Cossacks. In contrast, during Russia's troubled times in the early 17th century, the Cossacks rebelled against Russia, threatened Moscow, and aided the invading Poles. In 1613, at the end of this civil war, the Cossacks first nominated Michael Romanov as czar, thus founding the Romanov dynasty which lasted until 1917. Yet soon after nominating Michael, the Cossacks rebelled against him. During the late 17th century, Cossacks repeatedly aided Russia by fighting the Turks and Poles. In 1654, Bogdan Khmel'nitski, hetman of the Dnieper Cossacks, asked Russia to annex the Ukraine, which was done. But even after annexation, the Dnieper Cossacks occasionally sided with the Turks and Poles in wars against Russia. Meanwhile, during 1667-1671, Stepan Razin, a Don Cossack, led a vast peasant and Cossack revolt against the czar in the lower Volga Valley.

In the early 18th century, the Don Cossacks rebelled against Peter I (Peter the Great), while the Dnieper Cossacks under the leadership of their hetman, Ivan Stepanovich Mazepa (or Mazeppa), joined the Swedes in war against Russia. Peter crushed both Cossack groups, but allowed them to remain freemen, on condition that they render the czar military service. Thus as serfdom became almost universal in Russia the

Cossack farmers escaped this fate. In the late 18th century, Catherine II (Catherine the Great) had to crush a huge peasant revolt in the lower Volga Valley, led by a Don Cossack, Emelian Ivanovich Pugachev. Catherine, in Russifying the Ukraine, also destroyed the Dnieper River island fortress of the Dnieper Cossacks, who thereafter were absorbed into the peaceful Ukrainian population. But in the early 19th century, the Don Cossacks fought bravely against Napoleon I's invasion of Russia.

As part of the czarist land reform, in 1869 the Cossacks were given two thirds of the land in their areas of settlement, with the other one third held by the Cossack officers or army. In return, each male Cossack had to perform 20 years' military service, either active or in the reserve, providing his own horse and arms. Thereafter, the Cossacks became firm allies of the czar, and were famed as the czar's security police, charging on horseback with their whips and sabers into revolutionary mobs. However, in 1917, the refusal of Cossacks to charge into Petrograd mobs caused the abdication of the last of the Russian czars.

After the Communist Revolution in Russia, the Don Cossacks supported the White Russians against the Reds in the Russian civil war of 1918-1920. Later, in the early 1930's, the Soviet regime had great difficulty in collectivizing the unruly, freedom-loving Cossack farmers. The Soviets feared the Cossacks, and forbade Cossack cavalry units until World War II. Then modernized Cossack cavalry was organized, and fought against the *Wehrmacht* in wooded and swampy regions. A strange climax to Cossack history is that Georgi M. Malenkov, a Ural Cossack, succeeded Joseph Stalin in 1953 as premier of the USSR.

ELLSWORTH RAYMOND,
Assistant Professor of Soviet Government and Economics, New York University.

COSSE, *ko'sä*, **Charles de**, COMTE DE BRISAC, *bré'säk*, French soldier: b. Anjou, France, c.1505; d. Paris, Dec. 31, 1563. He was at Naples during its siege in 1528, and during 1544-1546 took part in campaigns against the English and the Imperialists. He rose to the rank of grand master of artillery in 1547, and in 1550 became marshal of France.

His brother, ARTUR DE COSSÉ, COMTE DE SECONDIGNY, *sé-gôn'dé-nyé* (c.1512-1582), was also a soldier. In 1552 he helped defend Metz against Emperor Charles V, and in 1554 he distinguished himself against the Spanish in Italy. He became marshal of France in 1567. He was imprisoned for political activities during 1574-1576. In 1581 he was one of the party which journeyed to London to seek the hand of Elizabeth I for François, Duc d'Anjou.

COST ACCOUNTING. See ACCOUNTING.

COST OF LIVING. Changes in prices are of major importance to many segments of the American population. To the worker, a rise or decline in living costs has direct significance in terms of the standard of living he can achieve or maintain. As consumers' prices rise, there is almost immediate pressure for higher wages. For some 3.5 million workers, cost of living wage increases are automatic, since these people work under contracts which include escalator clauses.

To the businessman, changes in wholesale prices affect his costs and his selling prices and thus, in turn, his profits. To the investor, price changes indicate the opportunity for new investment, with all the beneficial effects that flow in terms of job opportunities and additions to our supply of goods.

Prices are at the heart of the American economic system, for it is primarily through price changes that the various parts of the system are related to each other. Actions which affect any particular price tend to have reverberations throughout the economic structure.

After the conclusion of World War II, living costs rose sharply until they reached a peak in the late summer of 1948. This rise was interrupted temporarily during 1949, when the consumers' price index declined about 4 per cent below the level which prevailed in the fall of 1948. The cost of living resumed its upward spiral in 1950 and 1951, reaching new record levels. The rate of rise abated in 1952. Nevertheless, at the end of 1952, the consumers' price index was very close to the peak level reached. In 1953 and 1954 the index recorded only minor changes.

The following tabulation shows the annual changes in the consumers' price index in the postwar period.

	Consumers' price index (1947-49 = 100)	Annual change (percentage points)
December, 1945	77.8	
December, 1946	91.9	+ 14.1
December, 1947	100.2	+ 8.3
December, 1948	103.0	+ 2.8
December, 1949	101.0	- 2.0
December, 1950	106.9	+ 5.9
December, 1951	113.1	+ 6.2
December, 1952	114.1	+ 1.0
December, 1953	114.9	+ 0.8
July, 1954	115.2	+ 0.3

This table emphasizes that there were quite substantial price rises in 1946, 1947, 1950, and 1951. By contrast, the years 1952, 1953, and 1954 were marked by a minor increase in consumers' prices.

The armament phase of the economy completed its expansional phase early in 1953 and total defense spending showed little change as the year progressed. However, the overall total of economic activity continued to expand until the spring, largely as a result of a big boom in automobile production. By July 1954, the industrial production index of the Federal Reserve Board had declined to 124 (1947-1949 = 100) from the peak of 137 reached in the spring of 1953. Some declines in business activity became evident in the early fall of 1953, although unemployment continued at a record low level for peacetime. The decline was accelerated early in 1954.

Throughout 1953, prices were relatively stable. There are three broad measures of price changes: spot market price index, wholesale price index, and consumers' price index. All three indexes have been recently modernized to take into account changes in the buying and spending habits of our population.

The spot index is composed of 22 commodities that are traded or quoted daily on spot markets and organized commodity exchanges. It covers raw materials or items close to the initial stage of the productive process. This index is compiled daily. Its component groups are food-stuffs, raw industrial products, livestock and products, metals, textiles and fibers, and fats and

oils. This index is a very sensitive indicator of prices, and thus fluctuates more widely than the wholesale price index.

The wholesale price index is composed of approximately 2,000 items and includes the sales of all commodities at the primary market level. It consists of 15 major groups and 88 subgroups. It is published weekly and monthly.

The consumers' price index measures the changes in the prices of goods and services purchased by families of city wage earners and clerical workers. It prices about 300 items. The latest change in this index took into account items that have assumed significance in living standards in recent years. Included in this category are frozen foods, television, used cars, and the direct pricing of restaurant meals. The index also reflects the costs of home maintenance and ownership. These revisions have a significant impact on long-term comparisons.

For the spot and wholesale price indexes, the peak levels were reached in February and March of 1951, after a sharp rise following the start of the Korean War. From June 1950 to the early 1951 peak, the spot index rose 51 per cent, while the comprehensive wholesale price index rose 16 per cent. These prices then declined until early in 1953. Throughout most of 1953 and 1954, they recorded only minor changes. In contrast, the consumers' price index continued to edge up slowly. As of February 1951, it was 8 per cent above June 1950; by the summer of 1954, the rise was 13 per cent. This diverse behavior was due to several factors, including the following.

The difference in coverage between the consumers' price index and the wholesale price index accounts for a significant part of the differences in their movements. The former includes services such as rents, medical care, transportation, personal care and recreation, which are not priced for the wholesale price index. These services account for 28.5 per cent of the consumers' price index. The rise in the cost of these services had lagged behind the rise in other prices during the war and postwar inflation. Although the general level of the other prices has stabilized or declined since 1951, the prices of services continued to advance. For example, rents rose almost 15 per cent between March 1951 and July 1954; transportation costs rose over 8 per cent; the cost of medical care rose almost 14 per cent.

The prices of foods and apparel declined modestly from their 1951 or 1952 peak levels as wholesale prices fell. The decline in wholesale prices of these items was significantly greater than the fall in retail prices. It is typical behavior for retail prices to lag behind—to rise less and to fall less—than wholesale prices. The increases in the prices of services more than offset the decline in the prices of commodities, with the result that the consumers' price index slowly advanced.

The prices of services went up because of the deferred inflation and the continued rise in wage rates. Rents were held down by federal controls during World War II and in the early postwar years. In the later postwar years rent controls were gradually relaxed, and in many areas they were decontrolled. Accordingly, there was a steady upward trend in rents. For example, starting in September 1953, the Office of Rent Stabilization permitted rents to be increased by 30 per cent above the level prevailing on June 30, 1947. Federal rent control was terminated

on July 31, 1953, for all except a few critical defense areas. In New York State, where rents are controlled under the state Emergency Housing Rent Control Law, rent control was relaxed early in 1953, when permissive increases of 15 per cent were approved by the legislature. Despite these developments, rents rose by less than half as much as the advance in foods and apparel since 1939.

The rise in rates for public utility services (gas, electricity, telephone, and transportation) also lagged behind other prices. During 1953 these rates were still catching up to the past inflation in costs. The prices of such services generally do not keep pace with other prices because of the regulatory time lag which characterizes regulation by the public service commissions. The continued rise in wage rates also affected the prices of services. The costs for services rendered by painters, barbers, plumbers, and electricians involve a very high proportion of labor costs. These higher wage costs affect the prices of goods as well as services.

Finally, the wholesale price index includes the prices of both raw materials and semimanufactured goods which are not covered in the consumers' price index. These prices declined sharply after early 1951, and this development partially accounts for the different actions of the two indexes.

An outstanding development in 1953 was the end of the last of price controls on March 17, six weeks before they were scheduled to die. Initially, fears were expressed by some groups that prices would run rampant. The fears proved to be unfounded, since only a few selective price rises occurred. For example, prices of cigarettes rose one cent a package following their decontrol on February 25. This price rise reflected the fact that price control had held prices down despite sharp rises in costs and the repeated requests by manufacturers for higher prices. Further, even though some sellers of gasoline sought to increase their prices after controls were lifted, they were forced to bring their prices back to the former levels because competition was so keen that the market was not able to bear such a rise. In general, the increasingly competitive nature of the markets prevented a broad price advance, although selected increases did take place.

In Canada the consumers' price index has also recently been revised. It seeks to measure the changes in the retail prices of goods and services purchased by a representative group of urban families. Included in the new index are 224 items, almost 40 per cent more than the old index contained. Such items as carbonated and alcoholic drinks, chocolate bars, fur coats, fuel oil, and phonograph records are now priced in the index. The base period has been brought up to date (1949 = 100). The peak in the Canadian index was reached in January 1952. After that time the index gradually declined. In July 1954, the consumers' price index was 1.7 per cent below the peak, but for a period of two years the index had remained stable. Within the index the following changes had occurred—foods had moved down, shelter up, clothing had remained about the same, and household operations had risen in cost. In July 1954, shelter was at its peak level, food was down nearly 8.5 per cent from its high point in the last two months of 1951, household operations were almost 1 per cent under the April

1954 maximum, and clothing was nearly 5 per cent below its peak of December 1951.

During the years between 1939 and mid-1954, the consumers' price index rose nearly 84 per cent in Canada and about 94 per cent in the United States. In Canada food had risen 123 per cent, clothing nearly 100 per cent, household operations over 76 per cent, and rent nearly 50 per cent over this span of time. Thus it may be seen that, as in the United States, the largest increase in the consumers' price index occurred in foods and the smallest rise in rents. Further, by mid-1954, in both countries the food component had declined from its peak, while shelter was currently at its highest level. However, in Canada the index had remained stable for two years because the decline in food and clothing had been sufficient to offset the rise in the other items.

Consult Backman, Jules, *Price Practices and Price Policies* (New York 1953).

JULES BACKMAN,
*Professor of Economics, School of Commerce,
Accounts, and Finance, New York University.*

COSTA, kôsh'tà, Alfonso Augusto da, Portuguese statesman: b. Ceia, Beira, Portugal, 1871; d. Paris, May 11, 1937. He received his doctor's degree at Coimbra in 1895, and in the following year became a professor of law at Lisbon. In 1900 he entered the Cortes Gerais, and in that parliamentary body led in opposing the monarchical regime. With the establishment of the Republic in 1910, he became minister of justice. In that office he took steps which led to the separation of church and state (1911). He became premier and minister of finance in 1913. After the overthrow of President Bernardino Luiz Machado in 1917, he found refuge in Paris. Later he represented Portugal at the League of Nations, and served as president of that body in 1926.

COSTA, kôs'tà, Lorenzo, Italian painter: b. Ferrara, Italy, c.1460; d. Mantua, Italy, 1535. At Ferrara he studied with Cosimo Tura, and executed his earliest work. He went to Bologna in 1480. There he came under the patronage of the Bentivoglio family, and began his connection with Francia, with whom he worked closely. Following the exiling of Giovanni Bentivoglio in 1506, he went to Mantua to paint for the Gonzagas. Illness marked his last years, and he was succeeded as court painter in 1524 by Giulio Romano. A combination of simplicity and grandeur in form, together with harmonious grouping, characterizes his work. At Bologna is much of his best work, including the *Madonna and Child with the Bentivoglio Family*, in the Bentivoglio chapel of San Giacomo Maggiore, and the *Madonna and Child with Saints Sebastian, James, Jerome, and George*, in the Baciocchi chapel of San Petronio. Other important works include *The Adoration of the Magi*, the *Madonna and Child Enthroned*, and *Saint Sebastian Pierced by Arrows*.

COSTA CABRAL, kôsh'tà kà-bräl, Antonio Bernardo da, CONDE DE THOMAR, Portuguese statesman: b. Fornos de Algodres, Beira, Portugal, May 9, 1803; d. Sept. 1, 1889. He was educated at the University of Coimbra, and began his public career as a judge in Oporto and Lisbon. In 1835 he became a legislative deputy, and in 1838 governor of Lisbon. He was minister of justice from 1839 until 1842, when he instigated

a revolution, restored the constitution of Dom Pedro IV, and became minister of the interior in name and dictator in fact. His oppressive regime was overthrown in 1846, but he regained power in 1849 and inaugurated another harsh dictatorship. He was deposed by the Duque de Saldanhar in 1851. From 1859 to 1861 he was ambassador to Brazil, and beginning in 1862 he served as president of the superior administrative court.

COSTA MESA, kŏ'stū mā'sū, village, California, in Orange County; eight miles south of Santa Ana and near the coast. It is in a dairying, farming, and citrus-fruit growing area. During the period 1940-1950 it increased its population by more than 230 per cent. Orange Coast College is at Costa Mesa. Pop. (1950) 11,844.

COSTA RICA, a country in Central or Middle America, lying in a northwest to southeast plane between the republics of Nicaragua, to the north, and Panama, to the east, and bounded by the Caribbean Sea to the northeast, and the Pacific Ocean to the west and southwest. The land area approximates 19,650 square miles. Costa Rica is the fourth smallest in size among the 20 sovereign republics of Latin America, and the 1950 census of the Americas showed it to be the smallest in terms of population (800,875; est. of Dec. 31, 1952, 869,000). The principal cities with their 1950 populations are as follows: San José, the capital, 109,963; Alajuela, 13,903; Cartago, 12,944; Heredia, 11,967; Puntarenas, 13,272; Puerto Limón, 11,310; and Liberia, 3,390. The population is largely of Spanish descent and Spanish is the official language. Cocos Island, located some 300 miles southwest of the mainland in the Pacific Ocean, is under Costa Rican sovereignty. The island is about 5 miles long and 3 miles wide, with a maximum elevation of 2,788 feet, and has two fair harbors.

The national flag is blue, white, and red (for details see FLAG). The national anthem is *Nobile patria, tu hermosa bandera* (words by José M. Zeledón, music composed by Manuel M. Gutierrez in 1821). The monetary unit of the country is the colones (U.S. \$1 = 5:60 colones officially, 6.63 on the free market in 1952).



Coat of arms.

For the convenience of readers this article is divided into the following sections:

Physical Features	Government
Political Divisions	Religion, Education, and
The People	Justice
Natural Resources	History
Economic Development	Bibliography
Communications and Transportation	

PHYSICAL FEATURES

Geography and Climate.—Geographically, Costa Rica is a country of interesting contrasts, ranging from the high mountains of the *tierra fría*, where snow is occasionally encountered, to the lush, tropical *tierra caliente* of the Pacific and Caribbean lowlands. Two mountain groups dominate the physical as well as the human geography of the republic: the Cordillera Volcánica, to the northwest, and the Cordillera de Talamanca, to the southeast. The highest peaks, reaching over 12,000 feet in altitude, are to the south, as are the country's principal volcanoes: Poas (8,930 feet); Barba (9,534 feet); Irazú (11,260 feet); and Turrialba (10,918 feet). Between the bases of these volcanoes and the steep slopes of the main cordillera is the *meseta central*, or central plateau, a temperate highland on which is concentrated the densest rural population found anywhere in mainland Latin America. Within the central plateau are found about 75 per cent of the people of Costa Rica, and from this relatively tiny area come about 45 per cent of the nation's exports, in terms of dollar value. Here in this zone are found the principal cities of the land, including the capital, San José; Cartago, the former capital; Alajuela; Heredia; and other important towns. This temperate plateau lies between 3,000 and 5,000 feet in altitude, and is very healthful, with a mean temperature of about 68°F. During the dry season, from December to May, strong winds are a source of discomfort. Lowland zones from 3,000 feet to sea level suffer higher temperatures, with torrid climates characteristic on both seacoasts. Panamanians and coastal residents journey to the *meseta central* to escape the heat. Costa Rica, like eastern Nicaragua, Panama, and part of Colombia, has an annual rainfall of about 100 inches, though some areas are known to receive as much as 200 inches in a year. During the dry season, however, drought becomes an acute agricultural problem in certain areas. Problems of soil erosion have become serious in recent years due to exhaustive and unwise farming methods, and in some areas coffee production is down to one fifth of its former proportions.

Costa Rica has many streams. Chief river is the San Juan, which stems from Lake Nicaragua, and forms the international boundary for some of its length. The principal river lying entirely within the country is the Reventazón, also called the Parismina for part of its course. This river drains from the central plateau to a point 30 miles northwest of the port city of Limón on the Caribbean shore; the San José-Limón railroad follows its course for the most part.

POLITICAL DIVISIONS

The country is divided into seven provinces as follows:

Provinces	Area (sq. miles)	1950 Census
Alajuela	3,700	148,850
Cartago	1,000	100,725
Guanacaste	4,000	88,190
Heredia	1,100	51,760
Limón	3,600	41,360
Puntarenas	4,300	88,168
San José	1,900	281,822
Total	19,600	800,875

THE PEOPLE

Costa Rica has a population density of approximately 41 per square mile. Most of the population in Costa Rica is concentrated in the higher altitudes, and particularly in the pleasant central plateau. Like all other Latin American republics, Costa Rica is undergoing a rapid increase in population due to sustained high birth rates coupled with declining mortality traceable to improved sanitation and medical facilities, higher food production, and other factors. Even greater improvements are promised as the result of a health and sanitation agreement signed Feb. 13, 1951, between the United States and Costa Rica, which provides for a cooperative program of field work in Costa Rica.

Because of the isolation of the original colonists, and their failure to intermarry to any marked degree with such small Indian groups as were found on the isthmus, the population of Costa Rica today has a large percentage of almost completely Spanish ancestry. These are descendants of the original settlers from the Basque region and from Galicia and Aragon in Spain. Their preponderance makes Costa Rica unique among Latin American republics. For, in contrast to the pattern followed in many of the other republics, the early settlers did not intermarry widely with an aboriginal population, and Costa Rica thus avoided the mixed race problems which created economic and social difficulties in many Latin American states. The country is today more "white" than any of its sister republics of Central America. The 1950 census counted about 1,200 Indians, most of them confined on reservations. Their numbers are dwindling. An estimated 18,000 Negroes, most of them from the British West Indies, live in the Puerto Limón area, to which they were originally attracted by employment on banana plantations.

NATURAL RESOURCES

Flora and Fauna.—It is estimated that approximately one half of Costa Rica is nearly covered with virgin forests. This vegetation is at times so dense as to be impenetrable. From the coast to an elevation of 2,900 feet are tropical forests and savannas; above 6,800 feet are the regions of oaks and chaparrals, extending to 9,800 feet; and subalpine or subandean flora are characteristic in regions above this altitude and to the tops of the highest mountains. Plant life is abundant and varied, and Costa Rica boasts a greater variety of orchids than all the other Central American countries combined—more than 1,000 species. The dense forests also contain rich stands of valuable cabinet woods, such as ebony, balsa, mahogany, and cedar. Exploitation of timber resources has been somewhat retarded by lack of transportation facilities, and by the fact that the valuable trees often are found in mixed and widely scattered stands, making logging operations expensive if not impracticable.

Wildlife is abundant in Costa Rica, including jaguar, deer, puma, and many varieties of monkeys. Of avifauna there are reported some 725 species, and of Reptilia and Batrachia, over 130 species. Fish life is especially varied in the Pacific and Caribbean waters, and mainland streams contain many edible varieties. Promiscuous dynamiting of streams has caused serious fish conservation problems in recent years.

Minerals.—So far as is known, mineral resources are scanty. Gold is mined; between

\$400,000 and \$500,000 in gold bars were exported annually between 1934 and 1942. Exports have declined appreciably in recent years, however, with about \$29,000 reported for 1949. Manganese production as late as 1938 was as much as 300 metric tons annually; by 1949, however, exports had declined to \$9,000 worth of ore concentrate. In recent years, several United States oil companies have conducted explorations, but nothing worth exploiting has been discovered. As presently written, Costa Rica's mining laws do not encourage the investment of private and foreign capital for greater development of mineral resources.

ECONOMIC DEVELOPMENT

Agriculture.—In terms of national income, in 1949 the dollar value of agriculture (together with forestries and fisheries) totaled \$49 million, as compared with \$35 million for wholesale and retail trade, and \$24 million for manufacturing. Costa Rica is now, and historically has been, a land of small farmers. In 1954 some 85,000 landowners held an estimated 200,000 parcels of land, with a total cultivated area of about 1,404,000 acres. Problems of latifundia (the concentration of large holdings in the hands of a few) are not characteristic of Costa Rica. An exception exists, however, in the large parcels held by foreign-owned banana interests, though this type of latifundia appears for the most part to have benefited the economy to date. Principal exports are bananas and coffee, the former controlled almost entirely by the United Fruit Company. Cacao and abacá (Manila hemp) follow in importance. But coffee is the mainstay of the domestic economy, accounting for about one third of the total income derived from exports in 1950–1951. Between 1947 and 1951, coffee exports rose 69 per cent. Compared with the production of other Latin American republics, however, the total of Costa Rica's exports is small. Of all the coffee purchased by the United States in Latin America in 1950–1952, only 1.1 per cent came from Costa Rica. Coffee gives employment at least part of the year to one in every six persons in the country. Some 118,000 acres of land are devoted to its culture, or 50 per cent more land than any other crop uses. A large proportion of the coffee plantations are operated by small growers; of nearly 22,000 growers, only about half of them have fewer than 1,000 trees.

Costa Rica's banana industry began in 1875 through the enterprise of Minor Cooper Keith, an American engineer, who organized a company to take advantage of the new railroad he had just constructed to the Atlantic coast. The first shipments of bananas were made in 1880, and this led to the organization, in 1899, of the United Fruit Company. Production increased rapidly, reaching an all-time peak in 1913 of 11 million bunches. Atlantic coast banana plantings suffered heavily from fungus diseases in the mid-1930's, causing the company to shift operations to new plantations on the Pacific coast at Quepos and Golfito. It is anticipated that yields on these new holdings soon will exceed the all-time peak of 1913. Today, Costa Rica's production of bananas is exceeded only by that of Honduras in the Western Hemisphere. The dollar value of banana crops has recently exceeded the value of all food crops grown for domestic consumption. Cacao, important to Costa Rican economy, is the

nation's oldest cash crop. Written records as early as 1669 refer to harvests of this crop. In 1952, cacao exports brought over \$4 million. Abacá also is an important export crop, and holds promise of becoming even more valuable in years ahead.

In 1948, the National Production Council was founded to promote increases in food output by guaranteeing farm prices. In 1951, the council purchased and stored 13,000 tons of grain. By guaranteeing grain farmers' incomes, the council hoped to prevent the shift of workers and acreage to coffee production which usually results when coffee reaches price peaks. Experts agree that Costa Rica would benefit from a more varied diet of home-grown crops. Many staple products still must be imported, yet these could be grown in the country with little effort.

Costa Rica has organized a rural colonization program to stop farm-to-city migration, and to increase farm production. Semiabandoned farm land is being opened to settlement, and equipped with housing and machinery. Costa Rica contains 543,000 acres of grassland, some of which is devoted to cattle raising. Beef production and consumption are high in Costa Rica, compared with other Central American countries. The average inhabitant eats almost two thirds as much beef as the average person in the United States. Pork consumption is down, however, and chickens and eggs are too expensive for the average resident.

Industries.—Manufacturing now contributes about half as much as does agriculture to the national income. Food products lead the list, with printing and publishing second—an evidence of the nation's high literacy. Clothing and related products are third, and lumber products fourth. There are also brewing plants, shoe factories, and numerous small handicraft shops, operating to supply domestic markets exclusively. Though the waters of Costa Rica are rich in fish, the inhabitants derive little benefit from the fact. Little fresh fish is eaten in the nation, and little of the yield from tuna fishing, which centers at Puntarenas, comes back to Costa Rica.

Foreign Trade.—Costa Rica's foreign trade is principally with the United States. In the first six months of 1953, Costa Rica exported goods valued at \$21.3 million to the United States, and imported \$18.4 million. Principal exports are agricultural products and tuna fish. A shift in the type of imports from the United States has appeared in recent years, with the emphasis changing from light consumer goods to machinery and vehicles. In 1952, imports of machinery and vehicles valued at \$8.8 million were up 26 per cent from 1951, and the importance of electrical machinery alone increased 58 per cent in the same period. Conversely, metals and manufactures declined 10 per cent in the decade, as did importations in drugs and toiletries.

COMMUNICATIONS AND TRANSPORTATION

Domestic telegraph services, radio communications, and a part of the telephone system connecting San José with certain provincial cities are operated by the government through the Post Office Department. The principal telephone system, however, with headquarters at San José, is owned and managed by the National Power and Light Company. All America Cables has headquarters at San José, and branches in the port cities of Limón and Puntarenas. Approximately 30 commercial broadcasting stations operate in

the country. There are nine daily newspapers in the republic, including two English-language papers, all published in San José. Three railroad systems operate a total of 685 miles of track in the republic: the Northern Railway, from San José to Limón; the Pacific Railway, from San José to Puntarenas; and a third group of private lines owned by the United Fruit Company to serve the company's needs. Airline transportation is very important in Costa Rica, and three domestic airlines serve 24 outlying fields from the main airport at San José. International passenger traffic is almost entirely by air, though some steamship service is available from either port. The country is served by three major international air carriers: Pan-American World Airways, TACA International Airlines, and KLM (Royal Dutch Airlines). In 1951 there were 7,763 motor vehicles registered in the republic. An estimated 10,500 miles of highways served the nation, but only a fraction could be termed all-weather roads, and fewer than 62 miles were of concrete. Almost all the improved road is on the *meseta central*. The Costa Rican portion of the Inter-American Highway eventually will embrace about 313 miles, and of this total about 127 miles had been constructed in 1954. The unfinished portions present formidable engineering difficulties.

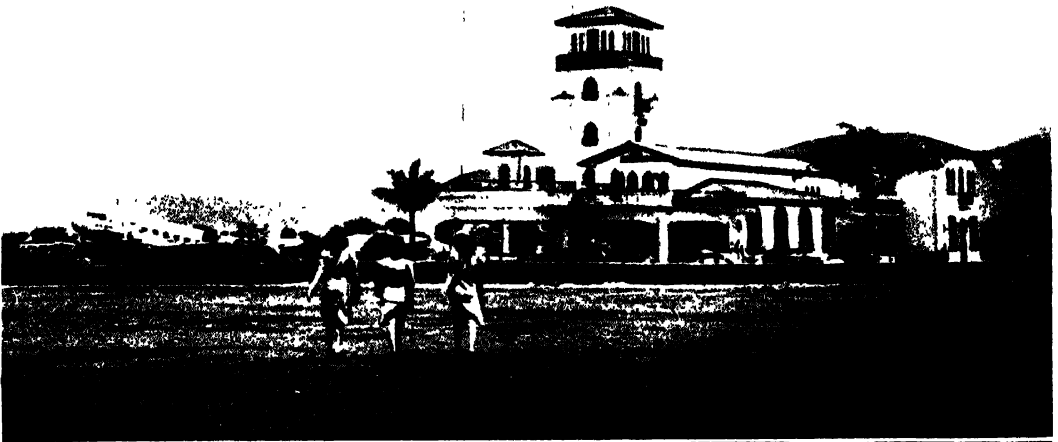
GOVERNMENT

Costa Rica is a republic, with a president elected by direct popular vote. A Constitutional Congress of 45 deputies also is elected by popular vote, and exercises legislative power. Members are elected for four years, one half of them retiring every two years. The president also is elected for four years, and the candidate receiving the largest vote in excess of 40 per cent of the total vote is considered elected. Under the Constitution of 1949, which replaced the oft-amended Constitution of 1871, all citizens over 21 may vote. Voting for president, deputies, and municipal councilors is compulsory for all males under 70 years of age. Administration of the government normally is entrusted to nine ministers, appointed by the president. Each province has a governor, also appointed by the chief executive. Governors act more as administrators of presidential orders than as independent executives. Provinces are in turn subdivided into cantons, each with a *jefe político*, or political chief, appointed by the president. Most important political acts and decisions are subject to national rather than local control, and Costa Ricans appear to take little interest in municipal government.

RELIGION, EDUCATION, AND JUSTICE

Though the predominating religion in Costa Rica is Roman Catholicism, the constitution provides for religious liberty. The nation's educational facilities have made Costa Rica the second most literate republic in Latin America (second only to Argentina). Its national university, founded in 1843, today has a faculty of 200 professors. English has been taught on the secondary level since 1944. Costa Rica often has been eulogized as the nation with more teachers than soldiers. Primary education is compulsory and free, and secondary education was declared free in 1949. In 1951, there were 1,250 primary schools with 5,301 teachers and 129,422 pupils; eight secondary schools; seven technical schools; and 59 private schools. In 1952, 16 per cent of

COSTA RICA



Above: The airport and Administration Building in San Jose, capital of Costa Rica. Below: Plowing with oxen and wooden plow in the lowlands on the road to Irazu Volcano. Right: View of Golfito, leading banana port, situated on a sheltered inlet on the Pacific coast.



Photos (center right) courtesy United Fruit Company; (others) © Ewing Galloway

Above: Homes of banana plantation workers on a hillside in San José.

COSTA RICA



Top left: The church at Desamparados, a residential resort and industrial center on the central plateau, near San José

Top right: Costa Rican children on a tour of their National Museum in San José. The country's educational system is one of the best in Latin America.

Left: Scene in Central Park, San José. Here the military band gives frequent concerts and on alternate Sundays the national lottery is drawn. This is also a popular place with the city's young people for their traditional promenades

Below: Coffee being spread to dry in Beneficio, near San José. The coffee of Costa Rica is of high quality and is the chief crop

Photos (top left and bottom) © Ewing Galloway, (top right) courtesy United Fruit Company, (left) © Philip Gendreau



the national budget was expended on education.

Justice is administered by a Supreme Court, four appeal courts, and the Court of Cassation. There also are subordinate courts in the provinces, and local justices throughout the nation. Capital punishment cannot be inflicted.

HISTORY

The discovery and naming of Costa Rica generally are attributed to Christopher Columbus. In 1502, Columbus, on his last voyage to the Americas, on September 18 sailed into what is today Puerto Limón on the Caribbean coast. There he saw Indians wearing gold ornaments, causing him to write to Ferdinand V and Isabella I: "I saw in this land . . . greater evidence of gold in the first two days than in Espanola (Haiti) in four years." From his enthusiastic reports it is assumed the name "Rich Coast" or Costa Rica was born, though one authority suggests the name is a corruption of *Costa de Oreja* (Ear Coast) after the earrings worn by the natives.

Early Spanish explorers found Indians living in Costa Rica in scattered groups, and estimated their number at 25,000. The three important tribes then occupying the area were still in the stone and wooden tool stages. They had achieved considerable skill in the casting of gold into ornaments, and in pottery work and stone carving. Some efforts were made by the colonists to enslave the Indians, but these attempts largely failed and the aboriginal population began to die off. The scarcity of Indians later prevented development in Costa Rica of the *encomienda* system of semislavery which flourished in other colonies. To the sparsity of aboriginals Costa Rica may credit its strength today as a nation of small, landed proprietors.

Columbus made no effort to settle the "Rich Coast." But the new land, named Nuevo Cartago by Spain, in 1509 came under the jurisdiction of Diego de Nicuesa, governor of Castilla del Oro, in Panama. For some time thereafter the area remained largely untouched. Costa Rica's true history as a political entity dates from 1562, when a separate governor was appointed for the country. Juan Vásquez de Coronado, first governor of Costa Rica, is credited with giving the country its first real impetus, bringing colonists, livestock, and seeds from Spain. Coronado founded Cartago, which remained the seat of government until 1823, when the capital was removed to San José. By 1573 some 50 families had settled in Cartago.

The prosperity and stability which were to characterize the country's later history were absent in the early colonial period. In fact, Costa Rica was the most backward of all Spanish colonial provinces during this early period. The neglect which she suffered stemmed principally from the fact that Costa Rica had little to offer in the way of plunder and riches of the kind Spain then was harvesting from Mexico and Peru. Poverty was further exaggerated by Spain's edict that no colony might trade with any country save the motherland. Intellectual development was at a standstill, and no literature could permeate the colonies save for a few books printed in Spain. Foreigners were not permitted to enter. But the restrictions on commerce probably contributed more to the colony's misery than any other factor.

This era of darkness persisted for nearly two and a half centuries. Costa Ricans were little

touched by the currents of revolt which were running strongly in other colonies early in the 19th century. And when independence did come, Costa Rica had done nothing to win it. On hearing that Guatemala had declared freedom from Spain in September 1821, the authorities of Costa Rica, not without hesitancy, declared independence in the same year. Costa Rica achieved freedom without bloodshed.

Costa Rica and other Central American states were drawn into the short-lived Mexican Empire (1822-1823) of Agustín de Iturbide. Following the downfall of this kingdom, a federation of Central American states was formed in 1823. But the federation never succeeded, due to poor communications between its components, basic differences in their societies, and the general unpreparedness of the various peoples to live together in a democratic union. So, in 1838, Costa Rica declared her sovereignty, and ten years later the Republic of Costa Rica formally was established. Numerous attempts later were made to re-establish the federation, but none succeeded.

Costa Rica's first chief of state was Braulio Carrillo (1800-1845), under whose efficient administration the new nation saw coffee promoted, order introduced, and honor and work inculcated into a demoralized people. But the severity of his dictator-like rule was his undoing, and he was succeeded in 1842 by Francisco Morazán (1799-1842), an advocate of federation. In his zeal to push union with other Central American states, Morazán marked himself as a despot, and he was shot two months after taking office.

In 1848, Costa Rica reasserted her sovereignty, and two years later her independence was formally recognized by Spain. But the new state soon found itself faced with another threat, this time from the north in the form of the filibuster William Walker (1824-1860). Walker's filibusters invaded Guanacaste Province, but were met and defeated by Costa Rican troops. By May 1857 the adventurers had been finally repelled by combined efforts of Costa Rica, Guatemala, El Salvador, and Honduras, and Walker himself was shot. The invasion helped to solidify the Costa Rican people, however, and to build a mistrust of foreigners which was to persist for many years.

In 1871, in the administration of General Tomás Guardia (1832-1882), was introduced the constitution which, though frequently modified, remained the nation's basic law until 1949. The later years of the 19th century saw improvements in communications and marked advances in the country's educational facilities. Costa Rica had its first free elections on Nov. 7, 1889, and since then the national political life of the nation has known the power of public opinion.

In the contemporary era, the influx of United States, British, and other foreign capital has continued, assisting in the development of the banana industry and the building of railroads and other facilities. In 1919, Federico Tinoco Granados, who was not recognized by the United States, was overthrown in a popular revolt in which women took an active part. Under the administration of Ricardo Jiménez Oreamuno, which ended in 1936, the nation's financial structure was reformed, and the Pacific Railway from San José to Puntarenas was electrified. Costa Rica declared war on Japan on Dec. 8, 1941, and on Germany and Italy on Dec. 11, 1941.

In the elections of Feb. 8, 1949, Otilio Ulate

Blanco, candidate of the moderates, was elected by a narrow margin over former President Rafael Ángel Calderón Guardia; the Congress annulled the election on the ground of fraud, and President Teodoro Picado Michalski, the incumbent, refused to recognize his successor. In March 1948, a revolt under Col. José Figueres Ferrer broke out in support of Ulate, and in May the rebels set up a junta in San José. In December, Calderón Guardia led an invasion from Nicaragua which was defeated and, at the invitation of the temporary government under Figueres Ferrer, the Organization of American States conducted an investigation. On Nov. 8, 1949, Figueres Ferrer turned the government over to Ulate and a new constitution was promulgated the following day. The army, which had been completely disbanded just before Guardia's invasion of 1948, was again abolished in January 1950.

On July 26, 1953, Figueres Ferrer was elected president by a 2 to 1 margin over his conservative opponent. He cited as his ideal the middle-of-the-road socialist government of Denmark, and described the movement which brought him to power as "a revolution of the middle class." On taking office November 8, Figueres Ferrer called for gradual transfer of large, foreign-owned enterprises to "local entities." He explained that he was opposed to "permanent, large-scale foreign investments," and said that, in his view, they constitute "an economic occupation, similar in some aspects to military occupation." He referred specifically to the United Fruit Company, and said negotiations were under way to make considerable improvements in contracts with the company.

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DAVID HELLYER.

COSTAIN, kōs'tān, Thomas Bertram, American editor and author: b. Brantford, Ontario, Canada, May 8, 1885. He left high school in Brantford at the age of 17 to do newspaper work. He edited *MacLean's Magazine* (Toronto) from 1910 to 1920, when he went to the United States to become associate editor of the *Saturday Evening Post*. He held that position until 1934, did motion-picture story editing during 1934–1936, and from 1939 to 1945 was an advisory editor for Doubleday, Doran and Company. He is the author of the historical novels *For My Great Folly* (1942), *Ride With Me* (1943), *The Black Rose* (1945), *The Moneyman* (1947), *High Towers* (1949), *Son of a Hundred Kings* (1950), *The Silver Chalice* (1952), and *White and the Gold; the French Regime in Canada* (1954). His projected 12-volume popular history, *The Pageant of England*, includes *The Conquerors* (1949) and *The Magnificent Century* (1951).

COSTELLO, kōs-tēl'ō, John Aloysius, Irish statesman: b. Dublin, June 20, 1891. He was educated in Dublin, and graduated from University College in 1911. He was awarded a bachelor of laws degree by Kings Inn, at London, in 1914. His public career began with his defense of Irish patriots after the 1916 uprisings. He was assistant to the attorney general of the Irish

Free State from 1922 to 1926, and served as attorney general from 1926 to 1932. During most of the years after 1932 he represented various sections of Dublin in the Dail Eireann. He headed a coalition government as prime minister from 1948 to 1951, and thus, in 1949, became the first prime minister of the Republic of Ireland. Following defeat of the Fianna Fail Party in the 1954 elections, he again headed a coalition government.

COSTER, kōs'tēr, Charles de, Belgian writer: b. Munich, Bavaria, Aug. 20, 1827; d. Ixelles, Belgium, May 7, 1879. He attended the University of Brussels. His *Légendes flamandes* (1858; Eng. tr. 1920) is a collection of old Flemish legends. His chief work, *La Légende de Thyl Ulenspiegel et de Lamme Goedzak* (1867; Eng. tr. 1943), recounts, in slightly archaic manner, the exploits of a 16th-century Fleming. Replete with earthy humor, it vividly describes Flemish life under Spanish domination. The hero is given the name and something of the character of the medieval German clown Till Eulenspiegel, and the book has been compared with François Rabelais' *Gargantua*; but despite many sources, the work is essentially original.

COSTUME. One or more garments used to clothe the human body, sometimes a special dress, historical dress in contrast to contemporary garments. Modern clothes worn in English-speaking communities, in the cities of Europe, and in South and Central America are alike in style, and are referred to as European clothes in order to distinguish them from Oriental and peasant costumes. While European clothes developed gradually from the garments of ancient Egypt, Persia, Assyria, Greece, and northern Europe, Oriental costumes changed very little until the 20th century. Peasant costumes, like religious costumes, are ancient fashions which have persisted with slight modifications. Notable examples are the costumes of Brittany and Rumania, Quaker and Mennonite dress, and the habits of nuns and monks.

Garments developed primarily from man's pleasure in decoration and ornament. Primitive man wore a lion skin as a badge of prowess, not for warmth, and people tattooed their skin as a form of decoration. The costume of primitive man often consisted of an elaborate headdress, ornaments of bone, teeth, bright metals or shells, and a mantle of fur or feathers worn over loin-cloths. Women wore short skirts of grasses or skins, and, for additional decoration, shells and beads. These ornaments were used to distinguish matron from maid. Clothes, like implements, are evidences of man's developing culture. Since European civilization began in the Mediterranean countries, we turn to the dress of Egypt, Asia Minor, and Greece for the beginnings of the history of Occidental costume.

ANCIENT MEDITERRANEAN COSTUMES

The dress of all ancient peoples, although simple in cut, was richly decorated. The function of clothes from the beginning was: (1) to proclaim the social status, profession, or wealth of the wearer; (2) to aid and protect hunters and warriors. A variety of garments were in use in any given period. Slaves wore simple garments. A king or pharaoh might wear a scanty, richly decorated garment while engaged in hunting or



EGYPT. 1-2 Persons of high rank, collar called *passum*, perfume cone on woman's head. 3—Priest or Pharaoh; headdress crown of Lower Egypt 4 Royal headdresses

fishing, then don a long elaborately draped robe, a towering headdress, and many ornaments for a banquet or ceremony.

The basic garments of all ancient peoples of the Mediterranean countries were (1) a tunic (q.v.), (2) the rectangular shawl or drape, and (3) the loin cloth for male slaves and workmen. The tunic was worn by both sexes, with or without a girdle. The rectangular shawl or drape was used by the men; the women contented themselves with a smaller cape or shawl. To these universal garments must be added (4) the short and long skirts worn only in Egypt, and (5) a leg garment worn only by Persians. The toga worn by the Romans was only a variation of the drape or shawl, being a segment of a circle instead of a rectangle. Modern dress has developed from these basic garments. Trousers or breeches are believed to have come from northern Europe rather than from Persia.

Egyptian Garments.—These were close-fitting, simple, and usually made of thin or transparent materials, white being the favorite color. Men wore a short kiltlike skirt, and women, a close-fitting tunic extending from breasts to ankles. Both sexes superimposed rectangular shawls draped like capes, and extra skirts. Egyptian skirts (c.1400–30 B.C.) had the fullness centered in the front, and highly decorative belts ending in triangular tabs. Men and women of rank always wore a round flat collar (*passim*) made of beads in elaborate patterns that extended from the base of the throat to the shoulders and breasts. The pectoral, an ornament on a chain, was worn only by people of high rank, as were the ornamental headdresses such as the hooded cobra, the miter of Osiris, etc. Both sexes wore bracelets, arm bands, ornamental girdles, and rings. It was customary to shave the head, and, in the case of males, the face. Wigs were quite generally worn. In the Empire period (c. 1580–1090 B.C.) they were tightly curled and are said to have been dyed bright colors. For ceremonious occasions men wore artificial beards. Women added fillets to their wigs, and, on the top of the head, a small cone, believed to have contained perfume. Sandals with turned-up toes were used by both men and women, although bare feet were very popular. Soldiers when in action wore protective leather bands from breast to waist, reinforced by metal disks. Children were clad like their elders or went nude.

Costumes of Asia Minor.—The ancient peoples of Chaldea, Babylon, and Assyria wore

tunics, and shawls of woolen materials in contrast to the thin clothes of the Egyptians. These garments were long; the hunting tunics of noblemen were cut in a V in front to give freedom. Men of Ninevah and Babylon, in contrast to Egyptian males, wore great black beards. Their hair was shoulder length, confined by a headband. The tall cap was reserved for royalty. The earliest masculine body garment was the long shawl, wrapped under the arms, then over the shoulder. Later, the tunic was the principal garment, on which, in course of time, a draped shawl was superimposed. Sleeves were short, the tunic ankle-length, except for fighting and hunting. Women's tunics were tight, unbelted, short-sleeved; to these might be added a short cape. Hair or wig was arranged in coils or braids. Two notable features of the costumes of the Near Eastern civilizations were (1) the heavy fringe on the shawls, and on the short tunics of warriors, and (2) heavy ornamentation. Garments were stiff with gold and jewels. Both men and women wore jeweled armlets, wide jeweled collars, and ear and finger rings.

Ancient Persian Dress.—Masculine garments were more intricate in cut but less ornate than those of Assyria. Men wore leg garments, and a coat with sleeves set into an armhole. In contrast to the short sleeves of other non-Hebrew peoples of Asia Minor, Persian men wore long sleeves. Persian trousers were long and full, but held tightly at the ankle. The materials used were linen, wool, and leather. Little is known about the dress of Persian women. They are believed to have worn long, tight-fitting tunics and scarves draped around the shoulders and over the head.

Biblical Costumes.—Hebrew costumes, after the Egyptian Exodus, display the same features as the Assyrian and Babylonian; the long tunic and the fringed shawl. Hebrew women wore ankle-length, close-fitting, short-sleeved tunics, and upon their heads tight-fitting sequin-embroidered caps covered by filmy scarves. During a late period, men wore an undertunic of linen, also a coatlike overgarment called the aba. From the Canaanites the Hebrews adopted perpendicular stripes, which became the distinguishing characteristic of their garments. Joseph's "coat of many colors" is believed to have been a garment with stripes running from the shoulders to the feet.

The foot covering of all the peoples of Asia Minor was much the same; simple sandals and elaborate ankle-high or knee-high boots. Soles and backs were leather; the front straps were crisscrossed above the instep.



ASIA MINOR. 1—Warrior of ancient Persia. 2—Assyrian king. 3—Feminine dress, Old Testament times.



CLASSIC GREECE. 1—Archer in short chiton, chlamys and boots. 2—Orator wearing himation over a chiton.

Classical Greek Costumes.—These differed greatly from those of Egypt and Asia Minor. They consisted of the chiton, the himation, and the chlamys, and were neither fitted nor shaped, but were draped upon the body. The Doric and Ionic chiton (tunic), ankle-length for women, shorter for men, was woven in a rectangular piece to the wearer's measurements. The chiton, put around the wearer, was fastened at the shoulder, the opening being usually on the right side. The masculine chiton was modified to resemble the short Asiatic tunic; it was sewed on the shoulder, and cut away under the arms to leave very short sleeves. The neck, which was cut out slightly, was bound with a band of trimming. This short garment with its three-inch belt did not reach the knees. The short chiton was also worn by Amazons and feminine athletes. In the earlier period, long chitons were worn by old and young men alike. Later, the young men adopted the short chitons, leaving their elders to wear the longer garment. The himation (cloak) was a large rectangle, like the Asiatic shawl, but unfringed. The chlamys was a smaller version of the himation, and was for the use of horsemen, travelers and foot soldiers.

Before the battle of Thermopylae (480 B.C.), Greek males wore long hair. After that event, the hair was worn short and always bound with fillets or ribbons, plus wreaths for the victors. (See *DIADEM*.) The famous hair arrangement of Grecian women, still often used in modern times, was a protruding knot arranged below the crown of the head to balance the profile of the nose, and was usually bound with ribbons. Straw hats were first worn by traveling Greek men to protect them from the sun. Elaborate helmets were adopted for fighting. Both sexes either went barefoot or wore simple sandals. For fighting and hunting there were high protective leather boots laced up in front, or a soft close-fitting foot covering resembling a sock in appearance. In infancy, children were wrapped in swaddling bands of linen, then dressed in chitons.

Roman Costumes.—Romans of both sexes wore a tunic very like the Greek chiton. The masculine garment when sleeveless and knee-length was called a tunica; when ankle-length and long-sleeved it was called a manicata. The feminine garment was the stola made of wool, linen, or silk; under it was usually worn a tunica intima of soft linen. For a wrap, Roman matrons had the palla, a long rectangular piece of woolen cloth identical with the Greek himation. Toward the end of the Roman Empire both sexes used a wide-sleeved tunic called the dalmatica, generally unbelted. In early Christian paintings



CLASSIC GREECE. 1—Doric chiton. 2—Ionic, with himation.

the female saints are usually dressed in dalmaticas.

The toga is the distinguishing Roman garment. In its early form it was the Greek himation, but, by the time of the Roman Republic (c. 500 B.C.) the garment was no longer a rectangle but had become a segment of a circle. Worn over a loin cloth, the toga was, at first, the only masculine garment of the Romans. By c. 300 B.C., it was worn over a tunica, and, by the time of the Empire (31 B.C.—476 A.D.) it was worn only on ceremonial occasions. Togas differed in color and decoration. The toga pura was made of cream wool and plain. It was worn by the leisure class and by artisans on ceremonial occasions. The toga praetexta had a purple band and was worn by officials, such as consuls, and by young boys. The toga pulla, dark gray or brown, sometimes black, was used for mourning. The toga picta, purple embroidered with gold, was worn by victorious generals, and later became the official dress of the emperor. The toga trabea came in three styles: (1) all purple, (2) purple and white, (3) purple and scarlet striped, and was worn by special personages, such as those consecrated to the gods, early kings, and by prophets or augurs. The shape of the toga changed through the centuries. It gradually enlarged until c. 100 A.D., after which it narrowed at one end. By the 7th century A.D., it had become a very long, heavily embroidered band, eight inches wide, and was wrapped over the shoulder and around the body. In this form it was worn by a Byzantine king, and later became part of the ecclesiastical vestments of the Greek Orthodox Church.

Roman men clipped their hair short, while the women wore their long hair in coils, braids, or elaborate curls. Their coiffures look like the feminine hair styles of the 20th century A.D.



ROMAN AND BARBARIAN. 1—Roman lady. 2—Toga clad citizen. 3—Teuton warrior and wife, c. 100-800 A.D.

Romans, like the Greeks and Assyrians, wore sandals and laced boots; these latter were made in black for senators and in red for patricians during the Imperial period.

BARBARIAN AND BYZANTINE INFLUENCES

Teutonic and Celtic tribes conquered by Julius Caesar wore clothes somewhat like the Romans, their main body garment being a short tunic. However, unlike the barelegged Romans, the northern European tribes wore a leg covering. Since they lived in a heavily forested region, this was possibly the first functional garment. From the 4th century A.D., when Constantine made Constantinople (Byzantium) the capital of the eastern branch of the Roman Empire, until the first Crusade c. 1100 A.D., Oriental influences in art and dress dominated Europe. The Byzantine court set the fashions for the first thousand years of the Christian era. European costume evolved from the combined influences of the Byzantine court and the northern barbarians.

Byzantine Dress.—Both men and women wore high-necked, long-sleeved tunics, belted or unbelted. A wide, short-sleeved tunic called a dalmatica, was frequently worn over the undertunic; the long, tight sleeves of the latter were revealed by the shorter sleeves of the outer garment. With the decay of the Roman Empire and the prevalence of Oriental luxury, men adopted the mode set by Roman women of wearing two ankle-length tunics. For more active pursuits, men turned to short tunics covering the knee, and hose (q.v.). In addition to the tunics both sexes wore circular or semicircular cloaks indoors and out. The difference in the appearance of Byzantine costumes from those of classic Greek and Roman came, not from a change in cut, but from the materials used. In contrast to the thin wools of Greece and Rome, Byzantine garments were made of heavy silks, and fabrics into which stripes of pure gold were woven. They were stiff with embroidery, and with gold disks and jewels that were sewed on to form all-over patterns. The women combined veils of gauzelike silk with their stiff heavy silks and embroidered wools. Court dress was gold and royal purple in color. Brilliant blues, reds, and greens combined with violet, enhanced the richness of the apparel. Shoes worn by both sexes were alike; made of fabric or soft leather of different colors, heavily ornamented with gold, jewels, and silk embroidery, they covered the foot and were heelless. Hair styles were similar to those of Rome: sometimes the women added turbans of rich silk or drew a veil over the head and shoulders.

Barbaric Dress.—Little that is authentic is known of the costumes of the barbaric tribes that poured down from northern Europe, until after the 6th and 7th centuries. From all that can be learned the special features of their costumes were: (1) short tunics worn by the men with trousers or braccæ, (2) close-fitting ankle-length or waist-length tunics, the latter combined with a skirt held about the waist by a drawstring, worn by the women, (3) short close-fitting sleeves (4) shoes of skin or leather, like Indian moccasins, or short boots akin to modern overshoes, tied about the ankle with thongs, (5) rectangular or semicircular mantles common to both sexes, (6) long hair worn by the women and braided only after marriage, (7) mustaches

and shoulder-length hair, either loose or braided, for the men, (8) helmets adorned with horns or wings, and (9) the plaids and stripes which decorated the coarse, rough materials of the garments.

The leg covering called braccæ, copied by the Roman soldiers from the Teutonic tribes, was probably a loose-fitting trouser wrapped about with thongs. The breeches supposed to have been universally worn from the fall of Rome to the end of the 13th century, were a kind of loin cloth, arranged like a baby's diaper. A leg garment called hose meaning "close-fitting" can be seen in a 9th century miniature.

MIDDLE AGES

By the time Charlemagne and the Christian bishops had created the Holy Roman Empire (800 A.D. q.v.), the integration of barbarian and Byzantine influences in dress had taken place in Europe. Kings and courtiers wore leg coverings; i.e., hose and breeches joined at knee or calf, plus a long-sleeved tunic. Women wore tunics and hose. As centuries passed, wealth and fashion demanded several tunics worn simultaneously; the overtunics had wide or short sleeves to show the under one, which was usually made of fine linen. The cut of these tunics, worn by both sexes, did not change from the 6th to the 12th century. During this period, the Christian ideal of asceticism demanded the concealment of the body, especially the distinguishing sex characteristics. For approximately six centuries there had been no change in the cut of garments; then, from about 1150 to 1450, clothes developed so rapidly in cut and variety, that this period marks the transition from classical to modern dress. In these centuries Europeans learned to tailor, and to weave different kinds of textiles, but the evolution of dress can be laid to the Crusades, to the change in armor, and to the growth of towns.

The Crusades brought enrichment and variety of new materials, artisans from the East to establish domestic weaving, and the first appearance of a fitted tunic. The upper section of the principal garment was cut to fit the body closely; at first, it was sewed or laced up under one or both arms each time it was worn. This one-piece fitted tunic was called the bliaut (c. 1150) and was followed by a more tailored garment, the cote-hardie (c. 1300). Worn over an undergarment or undertunic, the cote-hardie was long-waisted and fitted. To it a short scant skirt was attached for men, and for women a long skirt that became very full at the ankles. Cloaks were no longer draped over the shoulder in classic style, but opened in front like a modern cape. Women wore their hair in long braids or hid it under the wimple, a head drapery that encircled the face and reached to the shoulders. Elaborate headdresses did not come until after 1400 A.D.

Armor changed from a tunic of iron chains to plates of iron during the 14th century. The new, closely fitting plate armor encased the body, requiring extremely tight undergarments. Tunics were discarded for a hip-length doublet or jerkin, and tight hose that clothed both thighs and legs. We are told in the *Saint-Denis Chronicle* that it was divine wrath at the indecent costume of Frenchmen that caused their defeat in the Battle of Crecy. Except as a garment for old men and scholars, the classical tunic disap-

peared. The new military garment of iron plates brought about the first radical change in men's styles, necessitating clothes that were destined to develop into modern trousers and coats.

Community life, centering in towns rather than in isolated castle fortresses, developed the art of dress from simple to elaborate garments. Town life is essential for the display of dress. Gradually, a culture, dominated by the church and the laws of chivalry, gave way before an economy and culture based on trade and the power of individual princes. Rich merchants and powerful rulers were now enabled to proclaim their fabulous wealth and new importance in extravagant clothes of great variety of detail and ornament. During the 13th and 14th centuries fads multiplied, among them detachable sleeves of weird shapes and great length. Long trains were added to women's skirts, and both sexes decorated their clothes with heraldic devices and used fur as a trimming. Then followed parti-colored clothes, sections of which were made of different blocks of color. Hose became more important with the new short skirts worn by the men. Until the late 14th or early 15th century, hose consisted of long separate stockings with no joining at the crotch. Some hose had feet, those of ankle-length were held under the feet with a strap. Men are said to have worn drawers like a breechcloth, and the hose as it grew longer, was attached to these underdrawers by straps or was held by a garter. Shoes were of leather, velvet, or silk; soft leather boots were worn outdoors. Shoes with long pointed toes appeared in the 13th century, but the most exaggerated style did not appear until the 14th century.

The 14th century, the last period of the Middle Ages, brought the peacocklike clothes often erroneously associated with the whole epoch. Men's and women's dress became more and more differentiated. Women wore a tight body garment laced up the front, closely fitted over the hips, and with a skirt so long and full that it had to be held up by hand or tucked into a belt. This arrangement showed the rich lining of silk or fur. Over the doublet, which was laced or buttoned either in front or up the back, men wore a skirted garment. This overgarment had long exaggerated sleeves and was belted at the waist or at the thighs. Both the skirts and the sleeves were elaborately scalloped. Dignitaries and elderly men wore ankle-length robes slit to the knee to ensure ease in walking. The houpelande, the 14th century's most famous garment, was worn both indoors and out, and by both

sexes. It had a high standing collar, huge flowing sleeves, skirts that trailed on the floor, was made of costly material, and, at the height of its vogue, (c. 1390), all its edges were dagged (scalloped). This was also the period in which the long pointed shoes extended six or eight inches beyond the toes. Men and women attired in their flowing draperies glided like great birds from the Middle Ages into the Early Renaissance. Their descendants, becoming self-important and self-conscious, called for square, padded stiff lines, and the final rigidity of hoops and ruffs.

THE RENAISSANCE

By the middle of the 15th century the art of fine tailoring, and the craft of weaving intricate designs had been mastered, and medieval life dominated by the church gave way before the spirit of individualism and the power of kings and princes. Under this greater freedom, fashion in dress was permitted to satisfy the fundamental urge for (1) change, (2) contrast, (3) imitation, and (4) group conformity.

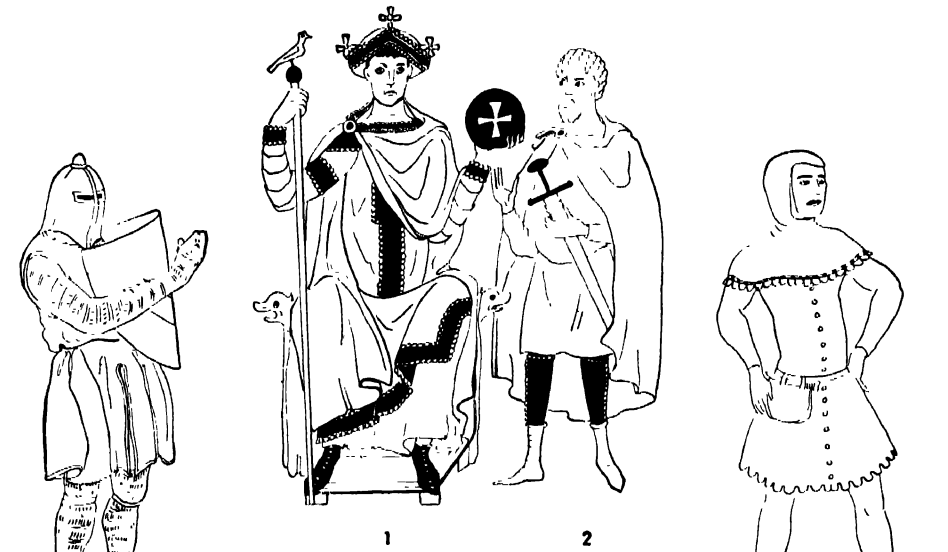
The excitement and exuberance of the Renaissance found expression in elaborate ornamentation, in richness of fabrics, in an infinite variety of costume detail, and made fashionable enormous headcoverings, great sleeves and neck ruffs. The heavy silks and velvets were strong and dark in color. The popular black velvet made a rich background for jewels, and was worn for solemn occasions—weddings and beheadings. The function of dress during the Renaissance was avowedly for decoration, self-expression, and entertainment, and so appears fantastic to modern eyes.

The Early Renaissance.—A period of exhibitionism preceded the Reformation. The differentiation between men's and women's clothes, begun with the introduction of plate armor, became more exaggerated to emphasize masculine and feminine anatomy. Men's garments, in this period, were divided into those for the upper body and those for the legs. They wore long tight hose to expose thighs and buttocks, and jerkins cut low to expose the neck. Women accentuated their breasts and hips, and bared their shoulders. Skirts were ample, and waistlines varied from those directly under the breasts to those of normal waist length. The revolutionary exposure of neck and shoulders, characteristic of the new spirit of worldliness, has continued to the present day, with the exception of a few decades in which high-necked gowns were the mode for all but court or evening dress.

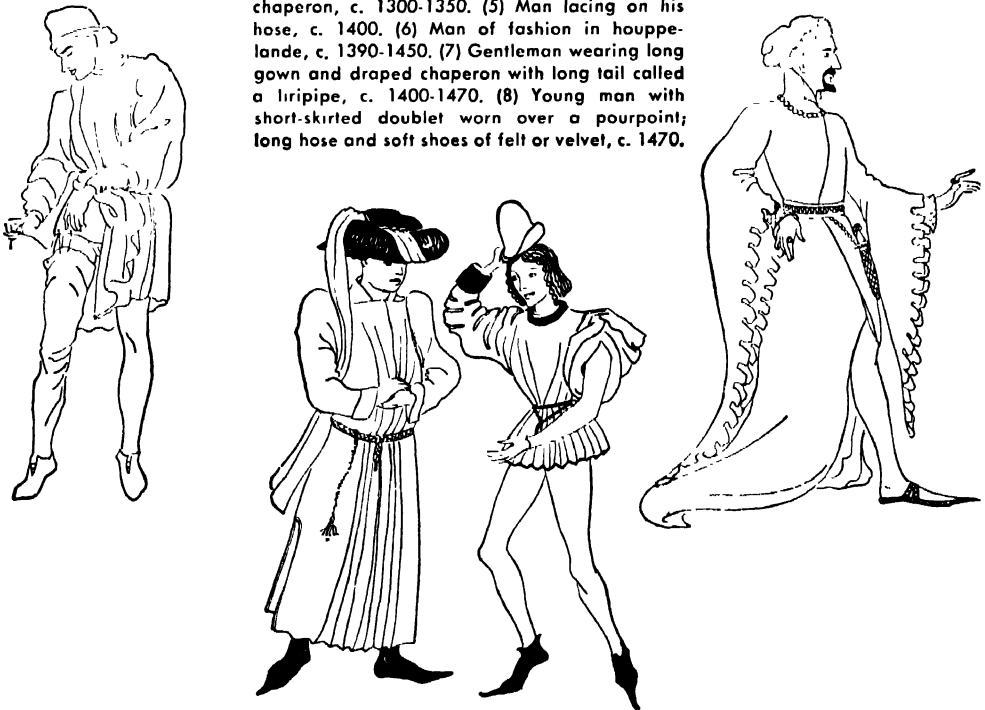


RENAISSANCE. 1—Scholar's fur-lined gown over inner gown, c. 1500-1536. 2—Henry VIII of England. Sleeveless gown over skirted jerkin with puff sleeves, c. 1525-1540. 3—Fencing master in puffed trunk hose called "upper stocks," c. 1550-1600. 4—Tighter trunks called "Venetians," c. 1560-1620. 5—Peascod-bellied doublet, c. 1580-1590.

COSTUME



E VOLUTION OF MASCULINE COSTUME from the Byzantine or Early Christian tunics to the Renaissance doublet and hose. 10th century A.D.: (1) Otto III in Byzantine style long royal tunic over undertunic, (2) Nobleman in short-skirted *bliaut*, or tunic, both wear rectangular cloak covering left arm, and soft Byzantine shoes. (3) Knight wearing *surcote* or sleeveless tunic over chain armor, c. 1300-1325. (4) Beginning of tailored garments for men, a *cote-hardie* with *chaperon*, c. 1300-1350. (5) Man lacing on his hose, c. 1400. (6) Man of fashion in *houppelande*, c. 1390-1450. (7) Gentleman wearing long gown and draped *chaperon* with long tail called a *liripipe*, c. 1400-1470. (8) Young man with short-skirted doublet worn over a *pourpoint*; long hose and soft shoes of felt or velvet, c. 1470.



COSTUME



(1) c. 1610-1625 c. 1585-1615



(2) c. 1625-1640 c. 1650-1660



(4) c. 1780-1790



(3) c. 1735-1750



(5) c. 1794-1800



(7) c. 1876-1882



(1) (2) (3) Aristocrats in formal attire when French and Dutch styles prevailed throughout Europe and America. (4) House dress or traveling costume, a favorite style of MarieAntoinette's time. (5) An *Incroyable* and a *Marveilleuse*, extreme modes of the Directoire period. (6) Riding habits of the early Victorian era. (7) Formal day and afternoon gown of the bustle period. (8) Evening gown of the bustle period.



COSTUME



(2) c. 1570-1588



(1) c. 1200-1300



(3) c. 1655-1670



(4) c. 1730-1745



(5) c. 1775-1790



(7) c. 1850-1865

(6) c. 1840-1860

Children were dressed like their parents until late 18th century (1) (2) (3) (4). From stiff formal styles (4) there was a sudden change to simplicity (5). The Victorian age again brought tight adult styles (6) (7). Since 1910 children's clothes have been designed particularly for children.



(8) c. 1890-1910



(9) c. 1925-1930



(10) c. 1950

M G N.

COSTUME



E VOLUTION OF FEMININE COSTUME from Byzantine tunic to Renaissance gown. (1) Long-sleeved tunic interior and palla, c. 450-600 A.D. (2) Wide-sleeved tunic over long tight-sleeved undertunic, 12th century. (3) First fitted tunic: *bliaut* with pleated skirt and mantle, c. 1150-1300. (4) Early style surcote and wimple, c. 1250-1325. (5) Surcote over cote-hardie, c. 1300-1380. (6) Houppelande with dagged sleeves (from playing card Queen), c. 1385-1400. (7) Long skirt fashionably held to show underdress, c. 1425-1480. Contrasts in Early Renaissance gowns: (8) German, c. 1500; (9) Italian, c. 1470.



RENAISSANCE. 1—Italian style, c. 1500–1550. 2 English, Flemish (English headdress), c. 1525–1550. 3—Dutch, German (overgown, puff sleeves), c. 1530–1550. 4—Spanish, c. 1560–1600. 5—French peasant, c. 1525–1600.

The Mid-Renaissance.—From the discovery of the New World (1492) to the reign of Elizabeth (1558–1603), European costumes showed definite national characteristics. Courtiers, rich merchants, and their ladies imitated the fashions set by (1) the rulers of small Italian and German principalities, (2) Louis XII (1498–1515) and Francis I (1515–1547), kings of France, and (3) Henry VIII of England (1509–1547). The clothes of Italians and Spaniards, although elaborate, did not distort the human figure with exaggerated paddings, whereas the clothes worn by the Germans were overlaid with great puffs on thighs, shoulders, legs, and arms. In contrast with bombastic German dress, English, Flemish, and French costumes have an architectural quality in the simple massing of rich fabrics. In all countries heavy, rich materials, large sleeves, close body-fitting garments and heelless square-toed shoes were worn. Headcoverings were part of the costume, and were worn indoors as well as out. Only peasants went bareheaded.

The Late Renaissance.—In the Elizabethan age (1558–1603) through the reign of James I of England (1603–1625) clothes became stiffer in form, even rigid. They were held in place by wire frames under skirts and ruffs, and by large crescent-shaped rolls that distended the shoulders. Women's bodices were stiffened with iron or wooden stays, while the doublets of the men were grotesquely padded to give a pigeon-breasted effect; i.e., the peasecod bellied doublet. Influenced by Henry III of France (1574–1589), men became stiffly corseted.

Garments and Styles.—Men's clothes during the Renaissance may be described as body garments and leg garments. The body garments were: (1) a shirt with rounded neck which was visible above the doublet until ruffs were introduced (c. 1580), (2) an unstiffened doublet (later called the waistcoat) without sleeves, although separate sleeves were sometimes tied in at the armseye, (3) another doublet (often termed a jerkin) with a skirt either hip- or knee-length, also with separate sleeves tied in at the armseye; its girdle holding a dagger or sword. Men of importance wore (4) an outer gown, knee-length or longer, which was sleeveless to show the jerkin sleeve underneath. During the first half of the 16th century, all sleeves were large and puffed, but, by the end of the Elizabethan age, were small and tight at the wrists with wide cuffs. (5) The short flaring cape was made fashionable by Philip II of Spain (1556–1598) and Henry III of France. Until c. 1510 men wore hose that extended to the waist; after that, they were divided into upper and nether stocks. Upper

stocks were (1) extremely elaborate puffed trunks, or (2) full-bloused breeches that barely reached the knee, or (3) the "Venetian" i.e., tight knee-length breeches. Nether stocks consisted of hose that met the breeches or trunks. Shoes were of leather, velvet, or silk, in the first half of the century they were slashed and puffed and had exaggerated square toes. Hats were of felt, beaver, or velvet, decorated with a curled plume, or a jeweled pin.

Workmen wore a shirt, a knee-length sleeveless tunic, and tight breeches with knee-high gaiters. Servants wore a coat shaped like a cassock; it was almost ankle-length buttoned down the front and covered tight breeches and hose. Until c. 1550 knights wore metal plate armor, whereas foot soldiers wore padded garments. Shields were carried only by crossbowmen.

Women's dresses in the early Renaissance had full, long skirts, high-waisted bodices with long tight sleeves, and open necks with wide collars, or rounded necks with none. Another type of dress such as the one depicted in the tapestry "The Hunt for the Unicorn" (c. 1492), was long, tight, and tubular, with a loose girdle. From 1510–1550, women wore a visible chemise, under a tight bodice; the bodice, cut square necked, was laced at back or front. Until World War II, this style was retained in the peasant costumes of middle Europe and the Balkans. Chemise sleeves were full and wrist-length. Over them were worn, (1) wide sleeves trimmed with shoulder puffs, or (2) slashed sleeves that revealed the white sleeve of the chemise. After 1510, skirts and bodices were cut separately. From c. 1525–1550 the overskirt was either open in front or looped up to show the underdress or elaborate petticoat. While Elizabeth Tudor was still a young princess (c. 1550), the Spanish style of dress was adopted throughout Europe. The soft gathers of the skirt, held out by the farthingale and, later, by the cartwheel hoops, became rigid to match the stiffness of the bodice. Skirts were enormous and bell-shaped. The stiff, tight bodices were worn with high necks in Spain; other countries preferred low necks. After 1550, the ruff was worn with both high- or low-necked dresses. The waist line, following masculine fashion, became very long in front and pointed. Like the men, women wore falling sleeves, crescent-shaped shoulder rolls, and short, sleeveless gowns that resembled sleeveless jackets. Women's shoes were like those worn by men; heels were introduced only toward the end of the 16th century. Women also wore hose.

Women's headdresses were important and varied. Italian women wore jeweled caps or

nets, Flemish women large and small bonnets. Germans wore great structures of stiff white linen, while English women adopted caps with eartabs, or folded linen and cloth arrangements that were much less elaborate than similar German ones. Spanish women wore velvet berets over hair looped in braids, and the French discarded the earlier cone-shaped hennin with floating veil, to wear Italian caps and Flemish bonnets. Toward the end of the 16th century, the high "pompadour" hairdressing made hats impractical. During the early years of the 17th century, women wore high-crowned beaver hats in imitation of the men. These hats were sometimes perched on top of a white housecap.

Clerical costumes changed after the Reformation. Non-Catholic clergy wore the long, large-sleeved gown of the scholar, or a sleeveless, long, dark-colored gown with large white puffed undersleeves like the vestments worn by modern Episcopal bishops. Catholic clergy wore the modern chasuble, or a long gown buttoned down the front, plus a sash, like the modern cassock. The hiretta, or "square cap" of the scholar was worn by both Catholic and non-Catholic clergy.

New Costume Accessories.—The handkerchief, as a costume accessory, is first seen in Renaissance portraits, although it had been carried by Roman consuls and magistrates as an emblem of their office. Other new accessories were lace aprons and small muffs. Gloves (q.v.), worn since the 12th century by kings and nobles, were now generally worn by all who could afford them.

FROM THE RENAISSANCE TO THE FRENCH REVOLUTION

Costumes in the 17th and 18th centuries evolved from the fabulous, fantastic, nationalistic, and individualistic clothes of the Renaissance to the garments and styles worn universally by all persons of Occidental culture in the modern world. During this same period, the habits of religious groups, the robes of dignitaries (judges and clergy), the uniforms of servants, and the clothes of peasants tended to become crystallized in one or more historic or nationalistic styles.

The 17th Century.—While Spain dominated Europe and her overseas empire, her costumes—stiff, tight, elegant, and somber—controlled the world of fashion. When the power of Spain was broken, costumes changed radically, for the first time in seventy-five years. Rigid, bombastic clothes, lasting until c. 1620, were followed by loose breeches and doublets, and softer dresses. Men discarded ruffs and corsets to fight the

Thirty Years War (1618–1648), and to colonize the New World. Spain was the exception to this trend, where old fashions persisted; men continued to wear ruffs and women enormous hoops. In Europe, England, and the New World, skirts now fell in straight lines from a high waist (c. 1630–1660); then, until about 1725 these full skirts were looped up about the hips, or cut open in front to show the brilliant and rich petticoats. While Charles I reigned in England, and Cardinal Richelieu dominated France, wide collars (either square or rounded), and short sleeves were worn. Both were lace trimmed. Loops of ribbon further decorated the garments of both sexes. Women retained their lace collars until the end of the 17th century. The V-shaped point of their bodices lapped over the looped-up skirts. The wide lace collars of the men were exchanged for lace jabots, linen cravats, and ruffled shirt fronts. When ruffs were discarded, men's hair grew longer, and was worn straight or in loose curls. By 1660, however, enormous blond wigs covered their heads.

From Sweden to Austria, from Prague to The Hague, and across the fields of England, men of the 17th century fought in plumes, lace, silk, and ribbons. Their descendants, during the first seventy-five years of the 18th century did likewise; also, they danced at court, and settled a New World along the Atlantic seaboard in their satins, velvets, and brocades. Among a few religious groups plain clothes were worn, but even Oliver Cromwell is pictured in a plumed hat, and our good Cotton Mather in a periwig as richly curled and magnificent as any worn by Louis XIV. Elihu Yale's coat with its great embroidered cuffs and brocaded knee-length waistcoat shown in his full-length portrait, must have come straight from London's best tailor.

The 18th Century.—Through the first quarter of the 18th century, the principal costume features and styles of the 17th century underwent slight change. The evolution in men's costumes to tighter breeches, flaring coats and shorter vests, and in women's clothes, to the round, bell-like skirt, took place after Louis XV came of age, and while he and his beautiful mistress, Madame de Pompadour set the fashions for all the world.

Women (c. 1735) donned hoops again to give skirts a bell-shaped silhouette. Before long, hoops turned into panniers that gave great width over the hips, but tended to flatten out back and front. The dress with a V-pointed bodice was reminiscent of the Elizabethan style. Women shortened their skirts to show pretty ankles and red-heeled shoes, and discarded the long, narrow lace aprons they had worn for almost a century. Men's and women's sleeves grew tighter in the 18th century, but retained their lace ruffles until the French Revolution.

This period, from the second quarter of the 18th century to the French Revolution (1789), is often called the "rococo period." In it, the dress of both sexes attained a unity of design, a flowerlike beauty, a restraint in decorative details, and an elegance that make the clothes of the mid-18th century among the most beautiful in the history of costume. They were essentially feminine, elegant, and delicate in color. The costumes of both sexes were made of such fragile fabrics as taffeta, satin, lute-string (lustring), a glossy ribbed-weave silk, and finest muslins from India and China. They were decorated



17TH CENTURY. 1—Home dress. 2—Street dress, England and America, c. 1640–1650. 3—Fashion of 1675–1700.

with lace, exquisite embroidery, and artificial flowers. After the death of Louis XV, Marie Antoinette set the whims of fashion; the delicate feminine spirit remained, but hoops were removed and overskirts were again looped about the hips in bustle style, while men's clothes became tighter and simpler in line, though remaining rich in material.

It is illuminating to recall that from the reign of Charles I to the French Revolution the men who dressed in lace, satin, brocade, and velvet, were the ones who founded modern science, the colonies that would become the United States of America, and created the Age of Reason. Their poets, philosophers, dramatists, and scientists included Milton, Defoe, Pope, Addison, Goldsmith, Voltaire, Rousseau, Congreve, Molière, Sheridan, Galileo, Sir Isaac Newton, Benjamin Franklin; their architects were Mansard and Sir Christopher Wren; their fashion commentators Samuel Pepys and Horace Walpole, and the great artists who painted them in their costumes were Rembrandt, Vermeer, Franz Hals, Velasquez, Rubens, Van Dyck, Hogarth, Thomas Bridges, Benjamin West, Copley and Sir Joshua Reynolds.

Evolution of Masculine Garments.—The evolution of the coat took place in this age. Except for minor changes of length and decoration, it has remained essentially the same ever since. Deep tabs were sewed to the doublet, making the garment skirted. The body and skirt were cut in one piece, and worn unbuttoned from the breast down. By 1650, the coat was almost knee-length, was worn unbelted, and the sleeves were sewed into the armseye. Called a cassock, this coat bore a marked resemblance to the Persian coat as noted by John Evelyn and Samuel Pepys. By 1690, when coats were knee-length, the back skirt was slit to the waist for ease of movement. Throughout the 18th century coats were knee-length or longer, and were worn unbuttoned over the long vest. No coats had collars until the American Revolution. Lapels were first used on the uniforms of British officers (c. 1750-1770). At first coat sleeves were shortened, showing both the puff and frill of the shirt sleeve, and the turned-back cuff of the vest sleeve. Sometimes sleeves were elbow-length; more conservative men wore theirs halfway between elbow and wrist. Sleeves lengthened during the 18th century, reaching wrist-length by the American Revolution. Elaborate cuffs became smaller.

Popular with fighting men and settlers in America was the "buff jerkin." Made of leather

and sleeveless, it was as long as the ancient tunic (c. 1325 A.D.) which it somewhat resembled. For fighting (1625-1650), either a steel gorget or cuirass, or both, with a wide military sash or bandelier (cartridge or powder holder) was worn over the buff jerkin, and, on the head, a helmet, or a wide-brimmed hat with plume. During the Restoration, there was a short, loose, waist-length jerkin for artisans, and a bolero jacket with very short sleeves for courtiers. These bolero jackets and jerkins were popular with sailors; they are the so-called "pirate" coats, and were worn with very full white shirts and "slops" (baggy breeches).

Long semicircular coats for outdoor wear remained unchanged from 1630-1725, when the great coat (a larger suit coat) took its place. The great coat became double breasted about 1780.

The shirt was one of the most important masculine garments then as now. It was made full-bodied, full-sleeved and with hand ruffles until the French Revolution. George Washington was still wearing hand ruffles in 1796, as a Washington family group, painted by Savage, shows. Napoleon later revived hand ruffles, but only for formal court attire. In the last half of the 18th century, and until the middle of the 19th, the front opening of the shirt was decorated by a ruffle or double frill which showed when waistcoats were cut low. Pleated bosoms and starched fronts, with starched detachable cuffs were in fashion from 1870-1880. Modern shirt sleeves with attached cuffs are very tight when compared with the full sleeves of the 17th, 18th, and 19th centuries.

Breeches, first loose and bloused (c. 1620-1630), were held at the knee by bands and ribbons, then, by 1635, became tubular and almost ankle-length. They were edged with fringe, and worn with wide topped boots and elaborate spurs. This fighting cock gear is familiar in pictures of musketeers and cavaliers (c. 1630-1650). At the courts of Louis XIV and Charles II, petticoat breeches, lavishly ornamented with ribbons, and tubular breeches, lace-edged, were fashionable for a decade. After 1690, and throughout the 18th and early 19th centuries breeches were tight, knee-length, and fastened with buckles. With petticoat and knee breeches, men wore silk hose and red-heeled buckled shoes; tight-fitting boots took the place of loose boots for travelers and soldiers.

Characteristic Accessories.—Always associated with this age are masks for highwaymen



17TH AND 18TH CENTURIES. 1—Lord Fairfax, a general in Cromwell's army; Roundheads and Cavaliers of rank were indistinguishable in dress, c. 1630-1650. 2—Courtier in petticoat breeches; loose shirt and short doublet were favored by sailors, c. 1660-1670. 3—Beginning of the modern coat, style of Louis XIV, c. 1690-1715. 4—The great coat (1720-1760); at this period it lacked a collar. added 1780 5—Lapels mark new fashion, c. 1780-1800.

and fair maidens, and muffs and face patches for both sexes. There were tall walking sticks, dress swords for court wear, short canes, and snuff boxes for men; and for women, long gloves of pastel shades and lace mitts. From the Orient came the banyan (a loose house gown) for men, and folding fans, and parasols for ladies of fashion. Except during the reign of Charles II, women in England and America were never seen in public without a cap or headdress. Good Hollanders always wore a cap, kerchief or coif. Until the time of Queen Victoria, conservative married women wore caps, kerchiefs, hoods, bits of lace, ostrich plumes, bonnets, and turbans even while indoors. Flowers, ribbons, and plumes were worn with formal evening dresses by young unmarried women.

Children's Clothes.—In the late 18th century, children's clothes, for the first time in history, set the styles of the future. While Jean Jacques Rousseau (q.v.) seriously pleaded for a return to nature, and Marie Antoinette played at being a shepherdess, little girls escaped at last from the corseted dress of matrons into uncorseted, high-waisted, soft muslin dresses, and little boys, discarding tight vests, sailed their kites in long loose breeches, soft loose blouses, and short-waisted coats. These boys and girls became the men and women of the Directory and the Empire. Not until they were old, would tight, concealing garments return to clothe their romantic-minded grandchildren with the corsets and crinolines of the Victorian age.

The Transition Decades.—The styles of the Directory (q.v.) and the empire of Napoleon were destined to bring to adults radically different costumes from those of the four preceding centuries. The new styles did not appear, however, suddenly on July 14, 1789, or in the summer of 1795. There was a spirit of social revolt against the formal modes and manners of the 18th century a decade before the meeting of the States-General (q.v.). Almost two decades before the French Revolution, soft muslin was worn for negligee under an overdress of silk or fine calico, called a *sacque*, and later, a *levite*. Over the shoulders, and crossing the breasts, was worn a lace or net *fichu*. Under many petticoats were panniers, a hoop, or a bustle. A negligee, as defined by Max von Boehn, was "any dress not meant for great occasions, that is, any house dress, outdoor or travelling dress." In the decade 1780-1790, women first discarded the stiff 18th century bodice with its wooden and iron stays, then the hoops. Later, the *sacque* or *levite* lost its skirts, and was eventually cast aside in preparation for the Directory and Empire when women would appear in high-waisted, transparent gowns, minus petticoats. During this same decade (1780-1790), before the guillotine summoned so many great ladies of fashion, women, like their little daughters, wore softly gathered muslin skirts, wide ribbon sashes and wide-brimmed Leghorn hats. In England, rustic simplicity became chic and Abigail Adams (q.v.) wrote home in 1784 "I am a little surprised to find dress, unless on public occasions, so little regarded here . . . I have seen many ladies but not one elegant one since I came." In this transition decade hair styles changed radically, too, and Marie Antoinette cut her hair. The high powdered coiffures carrying models of ships in full sail or a coach and horses disappeared, and fashionable women turned to soft curls, or caught



EARLY 17TH TO LATE 18TH CENTURY. 1a—Van Dyke style bodice, England and the Continent, c. 1630-1640; 1b—Puritan and Dutch style, c. 1660-1670. 2—Sackback or Watteau gown, c. 1720-1730. 3—The popular *Polonoise*, c. 1770-1780.

their long flowing tresses together with a ribbon.

During this period men's costumes also became simpler; breeches covered the knee, and coats, following military lines, became double breasted, narrow skirted, and grew lapels. Soft collars and cravats replaced lace jabots, while broadcloth and all fine woolen materials took the place of silken fabrics for every occasion but court dress. At the meeting of the National Assembly in France, in the spring of 1789, all members of republican or radical sentiment donned suits of black in contrast to the colored silks and satins of the French nobility. Men have since worn coats of dark green, many shades of brown, and dark blue, with faun colored or white breeches, but, not since the French Revolution, except for formal dress at Napoleon's court, have masculine fashions permitted the wearing of embroidered satins and brocades such as those worn during the Renaissance, the Restoration, and the 18th century.

EMPIRES AND ROMANTICISM

The art of dress in France went with the aristocrats to the guillotine. The balance, restraint, and elegance of the 18th century costume vanished. It was chic to be as dirty and disheveled as the Paris mob until Napoleon became first consul and made cleanliness fashionable again. The years 1795-1814 (known as the Directory, Consulate, and First Empire in France, and the Federalist period in America), was a time of frankness and exhibitionism. Men emulated the males of the Early Renaissance and displayed their figures in very tight clothes. They accentuated their legs by means of skintight pantaloons of elastic knitted fabric of light color or white, and displayed their thighs by the cutting away of the skirt of the coat until it became narrow tails. Women discarded corsets and petticoats, and bared their arms, shoulders, and breasts. A fashion magazine, *La Belle Assemblée* of 1813, in describing a costume speaks of "curls on the right side for modesty veiling." Some women even dampened their clothes to further reveal the contours of the body.

Women's dresses, evolved from the pre-Revolutionary negligee, took on what was imagined to be Grecian and Roman lines. Made of muslin, and cut high-waisted, these dresses had narrow tubelike skirts which fell in small gathers from a bodice that just covered the nipples of the breasts; the sleeves were small and puffed, covering only the arm socket. Under these thin muslin dresses, fashion permitted, at first, the



EMPIRE AND ROMANTIC STYLES. 1—Top-coated gentleman, c. 1795–1815. 2—Empire dress and turban. 3—The Spencer, short, often sleeveless, jacket, c. 1810–1820.

wearing of visible pink tights, but, after Napoleon crowned himself emperor (1804) French extremes vanished, and white stockings with a single chemise, were generally adopted. Little jackets, often sleeveless, called spencers, were fashionable indoors and out. Circular capes were worn for evening; for protection and warmth, there were long coats called redingotes and pelisses. A rectangular scarf was an essential accessory; headdresses of plumes, silk turbans, or flower trimmed bonnets with sandals and heeled slippers, completed the ensemble.

During this period, men adopted for all but court dress (1) breeches that reached the calf or ankle, (2) coats with narrower and shorter skirts that grew into long narrow tails (3) shirt-sleeves without lace ruffles, shorter coat sleeves, often without cuffs (4) bobtailed coats, like Eton jackets, for boys and youths. In London, Beau Brummel set masculine fashions, insisting on fine tailoring, spotless linen, harmonious dark colors, and classic simplicity.

By 1815, the younger generation grew bored with the display of anatomy. Under the influence of Goethe, Byron, and Shelley, romantic young men yearned for a mysterious, feminine creature. Women, ever ready to please, determined to become romantic young ladies. They began by veiling their arms in long sleeves; by 1820, they had covered their breasts with lace ruching, widened their skirts at the ankle, and put on more petticoats. Only a few women, and for a short time (c. 1815–1820), wore pantalettes; we find no pictures of them at a later date with hoop skirts. Before mid-19th century, pantalettes were garments for children and teenage girls only.

"Romantic" is a term that is often applied to

the costumes worn from 1815–1840. However, the crinoline decades that follow are part of the romantic period. In the first part of the era, we note especially the transition from the tube to the bell shape in the feminine silhouette, and the tendency of men's clothes to grow looser in cut, heavier in fabric, and less decorative in detail. We also note the influence on clothes of changing feminine attitudes. Robust, healthy exercise for women became unladylike. The granddaughters of the valiant and brilliant women of the American and French revolutions went indoors to faint, to worship respectability, to live by mottoes, and to conquer by tears. Except for the works of George Sand, George Eliot, the Brontës, and Mrs. Robert Browning, feminine literature is overly sentimental. Ladies in curls, bonnets, and gloves soon found themselves on high pedestals where they could not disturb their lords and masters who were busily building commercial empires, inventing machinery, producing new means of communication, passing reform laws, and attacking many social evils. Gradually, in spite of their conservatism, men accepted, for fortune's sake, more functional clothes.

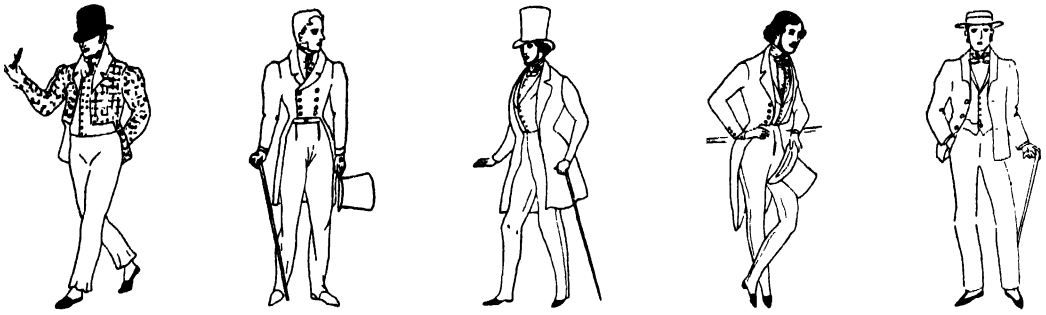
As the decades 1820–1840 advanced, waistlines in women's and men's clothes were lowered. Women's sleeves became enormous at the shoulder to balance the rapidly widening skirt. Gloves were essential, being worn indoors as well as out. Men discarded tight breeches for loose trousers, which, at first, were held under the instep by a strap. The dress coats of young men had tails, and were knee-length, whereas older, more conservative men, such as the character depicted as "Uncle Sam," retained long-tailed coats. The frock coat, however (worn for morning, business, sports, and all informal occasions), had flaring knee-length skirts and a tight, frankly feminine waist. Men of fashion wore corsets, while others tightened the waist by back lacings in the waistcoat. These waistcoats were of satin, cashmere, or cut velvet in pale tones.

From 1840–1860 women's bell skirts grew to enormous size. As in former centuries, such skirts required a small pointed waist. Once again, the feminine body was tightly laced, and, this time, neither ankles nor feet could be seen, except when ladies waltzed or danced the polka. Many ruffled petticoats and the crinoline (later the hoop) held out the wide skirts of lace, tulle, sheer muslin, or heavy silk brocade.

Except for formal evening gowns, which only the rich possessed, sleeves were long, and shoulders were covered. Shawls, wool for day and



EMPIRE AND ROMANTIC. Evolution of the bell skirt: 1—Style of c. 1825. 2—Bonnets, curls, and wider skirts, huge sleeves a passing fashion, c. 1835. 3—Crinoline and tighter pointed waist, c. 1845. 4—The Bloomer, c. 1849–1853. 5—Bell skirt supported by hoops, c. 1850–1865.



1—Bobtailed coat, long loose pantaloons worn in United States, c. 1811–1815, the “bell-hop” short jacket, a contemporary European fashion. 2—Man of fashion in the Romantic period, c. 1820–1830, when styles copied feminine waist. 3—Morning dress, c. 1840. 4—Evening dress, c. 1840. 5—Business and sport dress, c. 1854–1860.

lace for evening, were worn on all occasions. Hats were scooped bonnets, and hair was usually parted in the middle and drawn back to a knot on the neck. The difficulty of moving in the tight large dresses was commented on by Madame Carett, lady in waiting to Empress Eugénie thus: “merely to shake hands with the children or take a walk with them called for great fondness and much good will.” By mid-century, the man’s business suit consisted of plaid trousers, plaid vest, and a starched shirt. His coat reached halfway down his thighs. Gone were the high stocks of the early 19th century, as were, also, the wide velvet lapels. But he could still be romantic in evening dress, in a coat with tails and a long floating cape. However the business man might dress, the men of substance and position, such as bankers, politicians, doctors, brokers, professors and Protestant clergymen, wore the “Prince Albert” (a frock coat). This was a straight-bodied coat, with wide skirts of the same length before and behind, and familiar to Americans as the coat worn by Abraham Lincoln. Though discarded by bankers and brokers by 1905, it was still worn for all important day time functions by President Theodore Roosevelt (1901–1908), and by President William Taft (1909–1913).

ERA OF STEEL, EXUBERANCE AND ATHLETICS

The word bustle, meaning a frame worn beneath a woman’s skirt at the back, is of uncertain origin. It may well have been derived from the noun bustle, meaning agitation, fuss, commotion, haste; for such words aptly describe the era in which the bustle style characterized the feminine silhouette. The age of steel, of machinery, and of expanding international trade, stimulated by industrial expositions, created vast

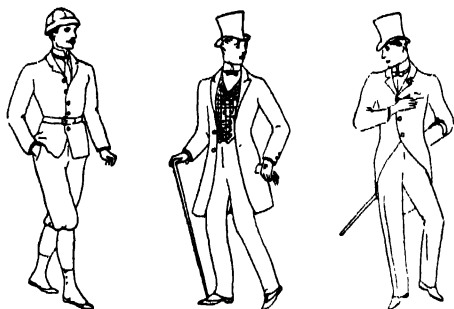
new wealth for the middle classes. It was a time of ostentation when all natural forms must be concealed by ornamentation. Small houses were given grotesque steeples and turrets; indoors, marble mantles were covered with plush draperies, tables were concealed by long velvet covers, everything was fringed, and even dinner bells and wastebaskets were draped. To display the marvels of the sewing machine, women’s skirts, in bustle style, were covered with all manner of draperies and with yards of pleated ruffles, while their bodices were decorated with such factory-made products as fringe, jet, and steel passementerie, and dozens of small steel buttons. Beneath the overornamented skirt and basque, the feminine body was encased in steel ribbed corsets, and concealed by many layers of underclothes. The feminine head was covered with pounds of false hair wrought into curls, braids, and Grecian knots. Over the hair was tied a small hat laden with velvet flowers, ribbons, and feathers.

In the age of expanding communication, factories, and new inventions, only man was attaining simplicity in his attire. A functional costume was gradually developing among rich merchants and bankers. Imitated for the masses in factory-made suits, men’s clothes, like machinery, became standardized. Only in sport clothes could a young man express his individuality or love of color. The technique of tailoring the fine woollens woven in British factories, together with the subtle art of good grooming, gave prestige and distinction to men of wealth who could afford to have their clothes made to individual measure and their accessories provided by a London tailor.

The bustle style adopted by the women, like the preceding tube and bell styles, came gradually. In 1860, the Empress Eugénie appeared for the first time without a hoop. At this period Monsieur Worth, the first of the great couturiers, was designing her clothes. This innovation was followed by a decade of transition when, flattened in front, the hoop was pushed out behind. With the universal acceptance of the bustle style in 1870, the corset remained important. It tightly encased the diaphragm and ribs, pushing up the breasts, then curving out over the hips in hourglass form. This corset, with tightly laced waist, was the foundation of feminine fashions until c. 1900. Then the corset acquired a “straight-front,” and later gradually flattened the hips and buttocks for the tube style of the 20th century. The bustle style was interrupted briefly, from 1874–1878, when tight skirts were given a long train. The bustle predominated and sur-



LATE 19TH CENTURY. 1—In vogue, c. 1874–1878. 2—Shopping or calling costume, bustle era, c. 1880. 3—Gibson girl of the Gay Nineties.



1—Sports costume of the bicycle era, 1880–1900. 2—Professional man, c. 1890. 3—Morning coat, c. 1898–1910.



1—Formal day dress, c. 1910. 2—Shopping or afternoon, c. 1915. 3—Evening dress, c. 1921.

vived until "the Gay Nineties." The bodice for the bustle skirt was a tight-fitting basque which extended below the normal waistline to overlap the skirt. Formal evening basques exposed necks and shoulders. All other dresses were long-sleeved and high-necked, and some had small standing collars.

Women skated and played croquet in long, heavy dresses, but when, in 1893, they began to ride bicycles in large numbers, and, later, to play tennis and golf, they demanded more freedom. Athletics brought the plain gored skirt and shirt-waist of the "Gibson Girl" era, but the new costume was still worn over a very tight hourglass corset. These Gibson Girl fashions were the transitional style between the bustle and the oncoming tube style of the second and third decades of the 20th century.

Fashion changes for men, from the crinoline days to the 20th century, were mainly concerned with the cut of the whiskers, hat styles, and the return of baggy, knee breeches of tweed for sport wear. Such breeches were called knickerbockers in America and were very much like the "slops" of the 17th century. Heavy beards (called "Boz" locks from Dicken's *nom de plume*), fashionable since 1842, disappeared during the bustle era. Side whiskers and mustaches remained until 1900. Polished boots, spotless linen, and a perfectly fitting coat of finest material were the essence of masculine fashion.

The new cult for sports had great influence on men's as well as on women's clothes. Young men wore bright striped blazers and flannels for tennis, cricket and informal summer outings. Older men wore knee breeches with a sack coat or belted jacket (a Norfolk) with knee-length wool stockings for bicycling, and added spats for shooting, fishing, and informal country life. Boys wore tight knee breeches or "pants" with a Norfolk jacket. Very small boys (c. 1880–1890) wore kilts. Caps with visors, especially the famous "Sherlock Holmes" cap, were worn for traveling and informal occasions. Long coats with a shoulder cape, or tweed capes of thigh length, were also popular. In the "Gay Nineties" top coats were short and flaring.

THE TWENTIETH CENTURY

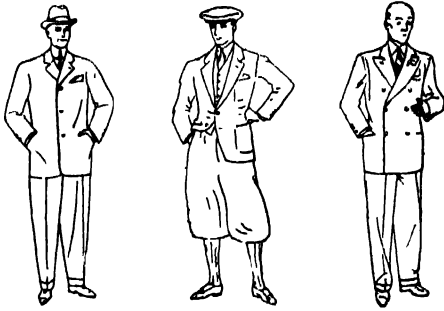
The outstanding feature of 20th century costumes, especially in America, is standardization of styles of dress for women as well as for men. With the growth of democracy, standards set by mass opinion have determined the acceptance or rejection of style changes. Any costume that receives universal approval becomes fashionable, especially, since clothes have been produced in great factories for millions, rather than made by

hand, as formerly, for the individual whims of kings, queens, or public favorites. However, such celebrities still, quite frequently, initiate fashion changes. It remains to be seen whether socialistic government planning, particularly in totalitarian countries, will, in future, determine styles of dress.

In the first decade of the 20th century, changes in women's clothes carried the long full-gored skirt (minus its bustle) toward the narrow tube style, which was achieved by 1910. The tight basque was first bloused c. 1895, and became a gathered blouse, with the waistline slightly raised, by 1910. From 1914–1921 the skirt showed a few variations from the narrow tubular form, such as the "peg-top" the "hobble," and circular skirt. By 1922, the silhouette resumed the tube form, with the skirts growing ever shorter in response to feminine participation in active sports and in business, reaching knee-length during the mid-twenties. As dresses grew tighter and shorter, the waist was lowered to the hip line, and the bust was flattened. Long dresses for evening returned by 1930, with fullness from knee to ankle. The tube style persisted with slight variations in waistline and in length until c. 1937, when the normal waistline returned. Skirts of day dresses became fuller from 1937–1939, and, by 1939, evening dresses were very full, and all formal dresses showed signs of returning to the bell shape. In day clothes, high necklines returned, and shoulders were padded to balance the growing skirt fullness. With the bust no longer flattened, and a narrow, though not tightly corseted, waistline, accented by gored or gathered skirts, the tube style appeared to have completed its cycle by 1947. At this time, all restrictions in the use of material imposed by World War II regulations were lifted, and all skirts became wider and longer.



1—Evening dress, c. 1924–1927. 2—General day dress, c. 1927. 3—Evening dress, c. 1932–1937.



20TH CENTURY. 1—Business suit, c. 1900–1915. 2—Sport suit, c. 1925–1930. 3—Double-breasted, c. 1935–1950.

Up to 1949 men's styles had undergone little change since the double- or single-breasted sack suits of c. 1905–1906. Worn with matching or contrasting trousers, these became universally accepted as the business suit or day costume. Coats were given longer lapels, and lost the extremely square padded shoulders. Trousers dropped the very wide cuffs of 1905–1910, and the baggy knees of 1924. Shirt collars became softer and lower, and stiff, detachable cuffs were discarded. During World War II, in striking contrast to World War I, top ranking generals laid aside the uniform coat or tunic in warm climates; this may point a new trend in men's daytime costume. Vests were being discarded by younger men and movie stars by 1947. For all informal occasions, young men often wore colorful, sleeveless pull-over sweaters, first popularized by the Duke of Windsor when he was Edward, Prince of Wales. He also introduced waistline pleats in men's trousers. The most notable change in men's clothes between World War I and World War II, was a growing informality in dress, together with the wearing of brighter colors, first in sport sweaters and tweed coats for the country, later in business suits. This informality and change was marked by President Harry Truman's choice of a dark blue double breasted coat and matching trousers for important daytime functions which formerly would have called for the cutaway coat and striped trousers.

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PICTURE SOURCES: Illustrations used in this article were drawn for the *Encyclopedia Americana* by Margaret G. Baldwin. Sources used in checking these illustrations were works of art in various museums; New York Public Library picture files; Barton, Lucy, *Historic Costume for the Stage*; and Walkup, Fairfax P., *Dressing the Part: a History of Costume for the Theatre*.

See also **DRESS**; and individual articles on items of wearing apparel

KATHERINE TRACY L'ENGLE,
Lecturer and Fashion Authority.

COSTUME, Academic. In the 12th and 13th centuries, when universities were taking form, they were under the jurisdiction of the church. Most of those studying were clerks in holy orders, or monks, and some were priests. They wore a habit or cloak, to which was attached a cowl or hood which could be pulled up over the head, or thrown back, according to weather conditions.

Academic costume, as such, seems to have originated at Oxford and Cambridge universities in England in the 1300's. As the British universities passed from the control of the ecclesiastics, the costumes took on brighter colors, the dress or convocation robes for the doctors, for example, being of scarlet cloth. The use of scarlet for dress use in doctors' gowns and for doctors' hoods seems to be about the only tendency toward uniformity to be found in British usage.

Academic costume has been in continuous use in the United States since colonial days. Columbia College (part of present-day Columbia University) was established by charter of King George II in 1754, under the name of King's College in the City of New York, and it transplanted to American soil many of the regulations in force at Oxford and Cambridge. The code, however, lost much of the high color so noticeable in Great Britain. The University of Pennsylvania, New York University, Trinity College at Hartford, Conn., Saint John's College at Annapolis, Md., the University of the South, and Hobart College all had codes in force before 1880. There was, however, no system discernible and few persons knew the distinguishing marks of the costumes for the various degrees. Few hoods were in use and some of them, worn by clergymen, were assumed to be articles of ecclesiastical rather than academic costume.

The idea of a well-defined system for the American colleges and universities arose about 1893 after there had become evident a decided movement toward the greater use of academic costume by senior classes, trustees, and faculties in institutions outside of those named above.

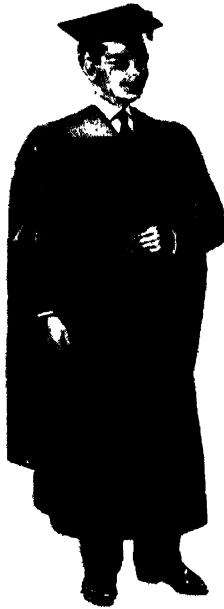
COSTUME, ACADEMIC



BACHELOR



BACHELOR



MASTER



DOCTOR



DOCTOR

COSTUME, ACADEMIC



DOCTOR OF SCIENCE
OR
LETTERS



BACHELOR OF ARTS

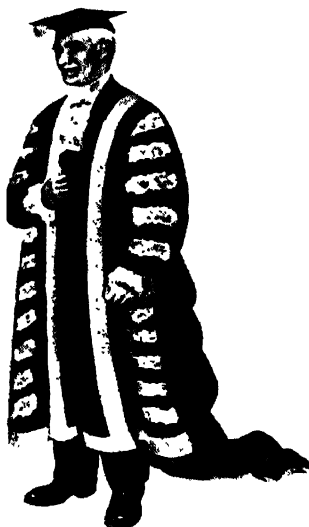


MASTER OF ARTS

DOCTOR OF SCIENCE OR LETTERS
(FULL DRESS)



DOCTOR OF MUSIC



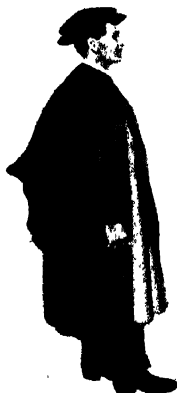
CHANCELLOR



DOCTOR OF DIVINITY
(FULL DRESS)



COMMONER



DOCTOR OF CIVIL LAW



BACHELOR
OF
CIVIL LAW
OR
LETTERS



DOCTOR OF DIVINITY



Historic academic costumes worn at Oxford University: A, c.1350, graduate of Merton College; B, 1361, earliest doctor of sacred theology, Queens College; C, 1470, Benedictine academic habit; D, 1619, regius professor of medicine at New College.

Bryn Mawr College used caps, gowns, and hoods for faculty and students in 1885, the faculty of Harvard was thus costumed for her 250th anniversary in 1886, the trustees of Yale about the same time, the seniors of Williams in 1883, the seniors of Wellesley for Tree Day in 1884, the Yale, Union, and Amherst seniors in 1891, the seniors of Harvard, Dartmouth, Syracuse University, and several others in 1892, the faculties of Brown and the University of Chicago and the seniors of the University of Vermont, Dickinson, Wesleyan, Tufts, Hampton-Sidney, Wells, Lafayette, Mount Holyoke, Elmira, Colby, and others in 1893. The movement was essentially a student movement to provide a senior badge and to improve the commencement week exercises, take the place of the "dress-suit" or "swallow-tail," and revive the tradition of a continuing and related university life. It was approved particularly by the students on account of its being uniform, thus overcoming all differences of dress. It was recognized that the gown made university functions more characteristic, interesting, and impressive to all beholders. It was discovered that the wearing of academic costume and the interest aroused by the dignity of the ceremonies resulted in a better attendance on the part of trustees, faculties, alumni, students, and friends of colleges and universities.

Since it was realized that there must be an intelligent system adaptable to all institutions if the large number of American colleges were ever to enjoy the full advantages of academic costume, an intercollegiate commission was formed in 1893 to draft a uniform code for caps, gowns, and hoods for the various degrees, so designed as to show in the hoods the sources of the degrees by use of the college colors. Col. John James McCook of the Princeton trustees, President Seth Low and Bishop Henry Codman Potter of the Columbia trustees, the Reverend Charles Ray Palmer of the Yale trustees, and Chancellor Henry Mitchell MacCracken of New York University were the most active members of this commission. Mr. Gardner C. Leonard in 1887 had designed gowns for his class at Williams College and had them made by Cotrell & Leonard of Albany, N. Y. He was greatly interested in this subject and had made extensive research into the European history of academic costume.

Following the publication of an article written by him in 1893 in *University Magazine*, he was invited to act as technical advisor to the commission. He prepared sketches, made up experimental hoods and gowns, and solved the problem of satisfactorily combining two colors in a hood lining by the adaptation of the heraldic chevron, as in the linings of the hoods of Princeton, Columbia, the University of Pennsylvania, Johns Hopkins, Cornell, and many others. The commission offered its code to all institutions of learning and it was soon officially adopted.

In 1895 the commission presented the Intercollegiate Code, and a charter was granted to Cotrell & Leonard, of Albany, N. Y., to act as sole depository for the Intercollegiate Bureau of Academic Costume, which is recognized as the authority on all matters pertaining to academic costume. Ever since then Cotrell & Leonard has maintained a library relating to academic ceremonial and a register of colors, materials, and arrangements of correct academic regalia. The bureau aims to keep from confusion the distinctive details of symbolic academic costume and to aid, without charge, all institutions with any information in its possession.

In 1932 the American Council on Education appointed a committee to determine whether a revision of the 1895 code was desirable. After correspondence and conference, departure from the existing code was suggested only in a few very minor details.

Gowns.—Photographs of the gowns used in the 1890's show them to have been rather shapeless, voluminous affairs, made for the most part by hand, but the use of modern machinery has resulted in neat, well-fitting garments which add to the dignity of the faculty, the graduates, and the commencement ceremonies.

Gowns for the bachelor's degree are to be fashioned from "worsted stuff" with semi-stiff yoke, long pleated front panels, and intricate shirring across the shoulders and back. The bachelor's gown should be worn closed and is distinguished by its long, pointed sleeves.

The master's gown has the same yoke effect but is designed to be worn open. It has a very long sleeve, oblong in shape, with an arc cut out at the bottom of the front. The oblong is closed at the base and the forearm protrudes through a notched slit near the elbow.

Gowns for the doctor's degree are also designed to be worn open, but they carry velvet panels draped around the neck and stitched down the front edges. These panels widen to five inches at the chest and are carried at this width all the way down to the hem of the garment. Three horizontal velvet bars are stitched on the upper arm of the full, round, bell-shaped sleeves. This velvet trimming may be either black or the color distinctive of the faculty to which the degree refers.

Gowns for both the master's and doctor's degrees are preferably of silk. Caps may be of serge, broadcloth or, for the doctor's outfit only, of velvet; the tassel of the doctor's cap may be of gold bullion. All materials referred to in the preceding paragraphs have been subjected to change as time has elapsed. Rayon, cotton, velveteen, and other synthetic fabrics are now being used and the further development of the manufacture of fabrics has progressed so that they are now more a matter of individual choice rather than of traditional dictation.

Hoods and Caps.—In America the hood is the most outstanding feature of all academic costume. Originally it seems to have had three uses: as a head covering, as a shoulder cape, or, when hanging from the shoulder, as a bag in which alms could be collected. The undergraduate hood is mentioned in literature as early as the 1480's. It is believed that when large wigs were worn, the cape part of the hood was cut open in front and a narrow neckband inserted. The entire garment, cape and hood proper, was allowed to fall back, producing approximately the effect which we see today. When wigs went out of fashion, the original shape was not restored, and since the hood is never used today as a head covering, it has remained in the shape of a narrow neckband connecting the two halves of the cape proper. In the earliest days of hoods at Oxford, the bachelor hoods were lined with fur. Masters and noblemen might use miniver and, during the summer, a silk lining instead of fur. Hoods for American usage were originally lined with colored silk. Changing fabric conditions have given rise to the use of artificial silk, taffeta, and rayon.

The mortarboard cap, proper for all degrees, should be worn both indoors and out upon all occasions when gowns are used. This applies to students, faculty members, and officers of the institution. The tassel is worn over the left front quarter of the cap top. The deeper part of the crown is worn to the back of the head. Caps are, of course, removed by men during prayer.

Degrees.—The shape and size of the American hood marks the college degree of the wearer, and under the system established by the Inter-collegiate Code, anyone attending an academic function in this country who is familiar with the code can readily distinguish at a glance the bachelors, masters, and doctors, and, at the same time, recognize the university or college whence each degree was obtained. This is a vast advance over the British system, because little relationship exists between the gowns and the hood-lining colors as used in the different universities and colleges there. Actually it is hard for many a Britisher to read the significance of the hoods of his own Alma Mater.

The outside of the American hood is made of black material, which should as nearly as possible match the material of the gown. The hood's outside is bordered with velvet or velveteen of the proper width to indicate the degree. The reading of the degree, and not the department in which the major work was done, governs the proper color of the border. Thus, a degree conferred as Bachelor of Science in Engineering requires the gold yellow of Science, whereas the Bachelor of Engineering degree requires the orange border of Engineering.

The shape of the bachelor's hood and the master's hood is similar, the former being three feet in overall length and the latter three and one-half feet. The doctor's hood has a base which is rounder and has an overall length of four feet. The respective widths of the velvet or velveteen borders are two inches for the bachelor's, three inches for the master's, and five inches for the doctor's hood. The colored lining of the inside of the hood is of the official color or colors of the institution conferring the degree. Some hoods, those of New York University and Chicago University, for example, have a solid color

lining. Those of some other universities or colleges, however, have what is called a chevron, or wide stripe of another color across the background color, or field. The hoods of Columbia University and Smith College exemplify the use of the chevron. Some institutions—for example, Cornell—use a double chevron, others reverse chevrons, and some use yet another device called a parti-per chevron. This device makes use of one color in the upper part of the lining and another in the lower part, as in the hoods of Washington and Jefferson College. In these ways the official colors of the college or university are combined. Since there are several hundred schools and colleges in America, various arrangements of the primary colors have had to be used and it immediately becomes apparent that the value of the Academic Code is great, if only to prevent the confusion which would soon have developed had each school gone ahead with its own color arrangements without reference to those colors which had already been registered with the Bureau by some other school.

If more than one degree is held, the gown and hood of the higher or highest degree are naturally worn. Two degrees of equal importance can be shown by dividing the velvet between the two indicative colors, but the lining can show only one conferring institution. Oxford precedent, however, is reported to direct that only a single degree from a single institution shall ever be indicated on a single garment. The American Council on Education in its report in 1935 stated that "it seems bad form to have an academic gown bear velvet stripes of various colors and the imagination dislikes to contemplate the results to which such a proposal might lead if, as often happens, the wearer held doctorates in three or more subjects."

The use of hoods by graduating classes is almost standard practice in America today and candidates who are known as eligible often don the hoods for the baccalaureate sermon or at a special ceremony at the beginning of commencement week known as "Hi Juvenes," when the names of all those who have passed the final examinations are read off. The hoods, with their aesthetic brightening of the otherwise rather somber costumes and their appeal to college spirit by the display of the college colors, thus yield their significance during the important commencement exercises.

Members of the governing body of a degree-conferring institution are entitled to wear the doctor's gown, but their hoods must represent only such degree as is actually held. In other words a trustee who holds a bachelor's degree only may wear a bachelor's hood with a doctor's gown and still be correctly attired for the convocation. A faculty member or an official of any institution who has received his degree elsewhere is entitled to wear a hood for the appropriate degree, lined with the colors of his resident school, but only during the period of his association with that school. At all ceremonies where honorary degrees are conferred, it is proper for candidates to wear the gown significant of the degree to be received. Holders of foreign degrees may wear hoods patterned on the American Code but lined with the national colors of the foreign country. Since many degrees are awarded to members of the armed services, it should be remarked here that such recipients do not wear the hood around the neck while they are in service dress. Instead,

it is folded and carried over the left forearm during the ceremonies.

A new degree, that of associate, has appeared on the graduation lists in recent years. The holder of such a degree is now recognized as a technically trained person. The curriculum for the associate is primarily a technical one and the program provides a two-year course of study in general academic and vocational subjects, including several courses usually taken in the first two years of the bachelor of arts program. In certain states, New York State for example, the Board of Regents has issued charters to some schools, with authority to issue diplomas. Some universities and colleges have followed this lead and offer the technical course and award diplomas and a distinctive hood to those students completing the two-year course. At Temple University the graduate wears a gray gown of the bachelor's type and a gray hood of the same shape as the bachelor's but without an edging of velvet. The hood is lined with the university colors in the same way as the hoods for the full degrees.

In assigning the colors to signify the respective faculties, the intercollegiate commission retained, as far as possible, historical association. For example, white for the department of arts is taken from the white fur of the Oxford hood; red, traditional color of the church, was assigned to theology; green, the color of herbs, to medicine; and golden yellow to science, etc.

Below is given the list of department of faculty colors as registered with the Intercollegiate Bureau of Academic Costume.

Agriculture	Maize
Arts, Letters, Humanities	White
Business Administration, Commercial Science	Drab
Dentistry	Lilac
Economics	Copper
Education, Pedagogy	Light Blue
Engineering	Orange
Fine Arts, Architecture	Brown
Forestry	Russet
Humanics	Dark Crimson
Laws	Purple
Library Science	Lemon
Medicine	Green
Music	Pink
Nursing	Apricot
Oratory	Silver Gray
Pharmacy	Olive
Philanthropy	Rose
Philosophy	Blue
Physical Education	Sage Green
Public Health	Salmon
Science	Golden Yellow
Social Service	Citron
Surgical Chiropody	Nile Green
Theology and Divinity	Scarlet
Veterinary Science	Gray

The codes for academic dress in Canada differ with each university. For example, King's College, in Halifax, Nova Scotia, established in 1802, uses the same code as Oxford University, England. The University of Ottawa follows to some extent French custom in conferring the degree of licentiate instead of master. Hoods are used here to denote the degrees despite the fact that French universities do not use them, but scarves instead. Laval University, on the other hand, uses scarves.

The universities of India follow individual codes but use the hood shapes of the universities of Great Britain. The University of Ceylon does not, however, use hoods. The University of Hong Kong has a code and uses gray silk for some and scarlet cloth for other hoods to denote academic degrees.

Official Colors.—The official colors for the hood linings of some of the leading institutions of the United States are as follows:

Amherst	Purple, white chevron
Boston University	Scarlet, white chevron
Brown	Brown, cardinal chevron
Bryn Mawr	Maize, white chevron
Catholic University	Papal yellow, white zone
Colgate	Maroon
College of the City of New York	Lavender
Columbia	Light blue, white chevron
Cornell	Cornelian red, two white chevrons
Dartmouth	Green
Fordham	Maroon
Georgetown	Gray, blue chevron
Harvard	Crimson
Holy Cross	Purple
Johns Hopkins	Black, gold chevron
Leland Stanford Jr.	Cardinal
Massachusetts Institute of Technology	Bright red, silver gray chevron
Miami University, Ohio	Bright red, white chevron
New York	Violet
Northwestern	Purple, gold yellow chevron
Ohio State	Scarlet, silver gray chevron
Princeton	Orange, black chevron
Radcliffe	Crimson, white chevron
Smith	White, gold chevron
Syracuse	Orange
Temple	White, cardinal red chevron
University of Alabama	Oxford crimson, white chevron
University of California	Gold, blue chevron
University of Chicago	Maroon
University of Illinois	Navy blue, two orange chevrons
University of Kansas	Dark blue, red chevron
University of Kentucky	Blue, white chevron
University of Maine	Light blue
University of Michigan	Maize, azure blue chevron
University of Minnesota	Old gold, maroon chevron
University of North Carolina	Light blue, two white chevrons
University of Oregon	Lemon yellow, dark green chevron
University of Pennsylvania	Red, blue chevron
University of Pittsburgh	Navy blue, gold yellow chevron
University of Rochester	Dandelion yellow
University of Southern California	Gold, cardinal chevron
University of Texas	White above orange, parti-per chevron
University of Washington	Purple above gold, parti-per chevron
University of Wisconsin	Bright red
Vassar	Rose, gray chevron
Wellesley	Dark blue
Williams	Royal purple
Yale	Blue

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O. J. HOPFNER,
President and General Manager, Intercollegiate
Bureau of Academic Costume, Cotrell &
Leonard.

COSTUME, Ecclesiastical. Hebrew.—The vestments of the priestly religion of ancient Israel were nearly all post-exilic in form if not in origin. The ephod and breastplate used originally to divine the Lord's will in some particular matter came to be restricted to use by the high priest. The detailed descriptions of each in Exodus 28 and in *The Antiquities of the Jews*, book 3, by Flavius Josephus (37-?100), represent the forms used or developed from the time of Ezra (5th century B.C.) on. Maimonides' *Mishnah Torah*, chapter 8, has some detailed

notes on texture, but this comes even later (12th century A.D.) as a statement.

The vestments existing in the year 70 A.D. may be described as follows: There was a linen breech cloth (translated as breeches in the King James Version), dictated by the Hebrew dislike of nudity. A coat of fine linen was cut long and close-sleeved. There was also a girdle of linen about 3.5 inches wide and (supposedly) about 58 feet in length. This was wound round and round the body, and finally tied over the breast, with the ends being permitted to hang down to the feet. The girdle was covered with elaborate needlework of many colors. The priestly headgear was a padded turban covered with white linen. The high priest had, in addition, an inscribed golden pate bound on to the turban by blue ribbon. The robe of the ephod was a blue sleeveless tabard worn by the high priest over the garments mentioned above. The stipulation of alternate golden bells and blue, purple, or scarlet pomegranates to be hung from its hem would indicate some secular origin, since in classic days the reproduction of pomegranates would have been regarded as a violation of the Second Commandment. The ephod, as described by Josephus, was a multicolored sleeved tabard somewhat shorter than the blue robe just described and was worn over it; it was held in place by an attached richly worked girdle. It has no apparent relationship with the linen ephod referred to in I Samuel 2:18 and elsewhere in the older books of the Bible. There is one strange reference to a rich ephod which became an object of idolatry in Gideon's time, but in general the ephod was some sort of linen garment once common to the prophets and all the clergy irrespective of rank, and was associated with divining rather than sacrifice. The breastplate (in Hebrew the word means a bag, or covering, on the chest) was a rectangular piece of material identical with the cloth of the ephod, doubled to preserve its ancient bag-like character. After folding, it was about nine inches square. Four rows of three precious stones each were set in gold upon it, and each stone was inscribed with the name of one of the twelve tribes. The breastplate was held in position at the top by two braided chains of gold running from the upper corners to the shoulder clasps of the ephod, and by two blue cords which ran from the lower corners to the girdle at either side.

Modern synagogue practice has abandoned all of the vestments associated exclusively with temple worship, but has preserved the external coverings required of the men of Israel. The prayer shawl (*tallit*) is a white scarf having on its ends the prescribed bands and fringes originally ordered to be worn on the mantle. (Numbers 15:38.) The cap (*yarmelka*) is generally of black, but varies much in shape. The phylacteries (*t'fillin*) are small leather cases bound by leather thongs to the forehead and to the right arm and hand. They contain small strips of parchment inscribed with the Summary of the Moral Law (Deuteronomy 6:8). The fringe (*tsitsit*) is an open-sided cloth scapular of waist length, held in place by strings tied at the sides; on the four bottom corners are clusters of ceremonial fringe much like those of the *tallit*. The *tsitsit* is worn under the shirt, but the fringes, although meant to hang free, are often gathered up into four pockets above them. The grave-clothes (*kittel*) are white tunics worn by the

married in special ceremonies on Rosh Hashanah and Yom Kippur, and are used at burial. (It should not be assumed that all or, indeed, any of the foregoing vestments are in universal use; dress customs will vary with individual congregations.)

Christian.—The early church was not interested in vestments. Clement of Alexandria (c.150–c.215) mentions a preference for white, but this meant only that Christians should wear ordinary clothing of that color when in church. The Fourth Council of Carthage (c.400) mentions an alb in a purely ecclesiastical sense, but as late as 430 Pope Celestine I wrote a scathing letter to the bishops of Narbonne and Vienne condemning their preoccupation with dress. He wrote, "We should be distinguished from the common people, or from all others, by our learning, not by our dress; by our habit of life, not by our clothing; by the purity of our minds, not by the cut of our garments."

Gregory I (540?–604) mentions the dalmatic maniple and pallium as being in common use in his church. The Fourth Council of Toledo (633) lists stole, chasuble, alb, ring, and staff as vestments within the accepted sense, although it is clear that they were not as yet exclusively ecclesiastical in use. By 840, Walfrid Strabo was interested in proving that the number of the vestments used was the same as that of the ancient Jewish priesthood; and by 850 Rabanus Maurus, the archbishop of Mainz, finds not only the number but the vestments themselves to be more or less parallel in intention and usage. Between the 9th and the 13th centuries the number of vestments used in the West was exactly doubled.

It is necessary to bear these facts in mind when examining the list of vestments which have come to be used in the Christian churches, since the sincere efforts of pious writers from the 13th century to the late 19th century have succeeded in persuading most people that symbolism rather than utility dictated the design of vestments. Gulielmus Durandus' *Rationale Divinorum Officiorum*, written in about 1286, should be noted as a classic example of this pious approach; his section on the ecclesiastical use of ostrich eggs and the symbolism involved is the medieval mind at its most fanciful.

Many vestments are used by both East and West. The alb (*sticharion*), the white tunic of ordinary Greek and Roman people, came to be the standard undergarment of the clergy. The two vertical stripes with which it was decorated, known as *clavi*, eventually were placed on an overgarment. Colored albs are common in the Eastern Church and were in wide use in the West up to the 16th century.

The dalmatic (*sakkos*), or Dalmatian tunic, was a wide-sleeved garment which went on over the head, and which when laid out flat had the shape of the letter T. (In the reign of Commodus, 180–192 A.D., it was regarded as clothing too foreign for a Roman emperor to wear in public.) The *clavi* or vertical stripes of the alb were transferred to it in the next century with the addition of stripes on the sleeves. By the 4th century a rich dalmatic became the sign of imperial favor; thus, the bishops of the two capitals might wear it as a special grant. The Roman deacons wore it as a distinctive dress. By the 7th century, the garment fell out of popular use and was kept only by the clergy. In the West

it came to be the characteristic dress of deacons. In the East since the fall of Constantinople (1453) the *sakkos* has been worn by all metropolitans and since the 18th century by all bishops. In both East and West the garment has always been the coronation dress of the emperors and kings.

The chasuble (*phelonion*) was developed from a peasant form of poncho known in Greece as early as 500 B.C. This garment, variously known as *paenula*, *casula*, or *planeta*, came, in a richer form, to be the outdoor dress of the official and noble classes. As such it was used by bishops and priests, but not until after the 8th century was it used exclusively (with the exception of sovereigns) by the clergy. In the East, the original form of a half circle, joined up the front with an aperture for the head, has been reduced in depth so that the forearms may move freely (the same was true in the West in the 11th century). In the West, the original shape was altered by shortening the sides rather than the front. In the Renaissance period the sides disappeared entirely and a tabard shape was all which was left. After the Gothic revival of the 1830's, the older forms again became popular.

The pallium (*omophorion*) was originally a classic-period Greek shawl called himation. It was about 18 feet long and 6 feet wide, and was a complete covering, being draped over the left arm, across the back of the body, under the right arm, and across the front of the body to the left shoulder again. By the 2d century A.D. it had become the characteristic dress of teachers and scholars. By the middle of the 4th century it had ceased to be an article of common dress and was used only by the official classes; at this period it was worn folded into a long, narrow strip. When worn over the chasuble it was carried over, rather than under, the right arm. The inevitable result of folding was that the additional thicknesses should be dispensed with; this left a strip about 14 feet long and 8 inches wide. As officials, the bishops all wore the pallium, eventually ornamented with crosses; bishops still wear it in the East, but in the West it has come to be treated as exclusively an archiepiscopal ornament. It is also to be noted that in the West the character of the pallium was altered from that of a long, narrow strip to a Y-shaped yoke put on over the head and held in place on the shoulders by golden pins.

The stole (*orarium* and *epitrachelion*) was originally a long, large napkin worn round the neck by all classes of people, including slaves. By the 4th century the deacons of the East were wearing the orarium on the left shoulder, but it was certainly in connection with practical necessities involved in administering the Eucharist. Several centuries later it was adopted for deacons by the West. Just when the stole for priests (*epitrachelion*) and bishops became an exclusively hieratic garment is not clear, but it is universal by the 7th century. Scholars are at a loss to explain the derivation of the ecclesiastical use of the word stole from the Greek use of the word to mean a long, flowing robe. All Western stoles are now long, slender pieces of material richly decorated, worn in the manner prescribed. The priest's stole in the East is fastened down the front, and is, therefore, put on by passing the head through the loop thus formed. In both East and West priests wear the stole under the chasuble when they are vested for the Eucharist;

it is considered appropriate for use at the administration of the several sacraments.

The girdle or cincture (*zone*) was the ordinary means of confining the tunica alba about the waist. It was not until the 8th century that it came to be considered as part of the vestments appropriate to ecclesiastics. Its Latin title, *subcingulum*, is a reference to its being hidden by the alb when pulled out over it. It was anciently richly decorated; now it is ordinarily of finely woven white linen thread, except in the East, where the original rich form is preserved. In both East and West it is used to hold the priest's stole in place when full eucharistic vestments are worn.

The maniple (presumably *pallitza*) was originally a handkerchief carried in the hand. In the West it became an ornamental band matching the stole, and worn on the left forearm; in the East it has retained its ancient distinction as a decoration of honor, but is worn as a lozenge-shaped richly decorated piece of fabric suspended from the right of the wearer's waist. In the East it is worn by all bishops, but only certain of the priests are granted the right to wear it. Another form of it is rectangular shaped and is known as an epigonation.

The miter (*mitra*) is, as the Easterns properly translate it, the crown worn by a bishop. Originally it had reference to the cord which bound either the Phrygian cap or that portion of the toga pulled up over the head and called amictus. The cord eventually hardened into a jeweled band and became the imperial crown; ecclesiastics wore it surrounding their white skull caps as an imperial or royal honor received from the throne itself. The first reliable mention of it is in the 8th century, and it was not until the 11th century that it became the ordinary head-dress of bishops when they were not in church. (The imperial crowns extant are all forms of miters.) The miter was first worn in church in the 12th century. Starting as a bound skull cap it tended to increase in height; thus the Eastern miter is dome-shaped. Although miters were not worn generally until after the collapse of the Byzantine Empire in 1453, the East, like the West, now grants them to abbots and certain archpriests. In the West, in the 12th century, a vertical band was introduced which depressed the center and left two bulbous globes on either side of it. By the 13th century the sides were depressed rather than the center and the familiar triangular shape came into fashion. The original character of the miter has been preserved in at least one aspect of the Western miter and that is in the two ends of the original cord which hang down behind; they are called infulae. In the West there are three kinds of miters: precious, ornamented, and simple. The papal tiara is a development of the Phrygian cap, or phrygium, which was conical in form. It was not until the 12th century that ornamental bands came to be added. The first coronet as such appeared in the 13th century; the second was added in the 14th century by Boniface VIII (r. 1294-1303); one of his successors, Clement V (r. 1305-1314), is credited with having added the third. As the coronets were added, the cone took on an increasingly bulbous shape. The luxurious taste of the Renaissance produced some incredibly valuable tiaras for the popes of that period.

The pastoral staff (*paterissa*) is first men-

tioned in the 5th century, but the reference is clearly to a staff of office symbolic of imperial authority delegated to a bishop. The crook form at the top, which is doubled in the East, seems to have developed from the lituus of ancient days. The title of this staff in Latin, *baculum*, would seem to indicate that the staff was originally regarded as a scepter, which is still true in the East. Needless to say, the symbolism of the "shepherd's staff" is first heard of in the 11th century, and in England. The paterissa did not come into general use by bishops in the East until the 15th century. In both the East and West, abbots and, later, abbesses have come to have the privilege of carrying this staff. The decorated napkin by which the staff is held is called the sudarium or vexillum.

The pectoral cross (*staurós*) had its origin in the reliquaries which were commonly worn by all Christians from the late 4th century on. In the East it is still worn by all the clergy, although archpriests are granted more elaborate and richer versions of it. In the West, it developed into an exclusively episcopal ornament worn over all but eucharistic vestments; the custom grew slowly, however, for the first reliable instance mentioned is in the 13th century, and certainly did not become a general practice until the end of the 17th century.

The cassock (*anteri*) is a long, close-fitting coat. In the West it was originally a garb common to all people, and it was not until the 11th century that it became specifically the standard ecclesiastical undergarment. In the medieval period it was often lined with fur and known as a pelisse—hence superpellicium, or surplice, describes a garment worn over a pelisse. The dress cassock of the West has a short cape, double-over sleeves to the elbow, and deep turn-back cuffs; it is known as a soutane. Ordinary clergy wear black; bishops, purple; cardinals, scarlet. Trained cassocks did not become popular until the 16th century.

The gown (*rasson*) has also been used by both East and West. In the East, the cassocks are often of white, but are covered with a black or blue loose-sleeved gown much like the Persian caftan in cut. In the West, the exterior gown was common to all the learned or leisured classes well into the 15th century, but from that time on it became the exclusive habit of ecclesiastical, judicial, and academic groups. There seems to be little authority for deriving preaching gowns, judges' gowns, and academic gowns from the Benedictine habit.

In addition to the foregoing the East has certain vestments and ornaments peculiar to itself. The cuffs (*epimanikia*) are stiff coverings laced on the forearms of a member of the clergy when he is vested in the sticharion (or alb). The cuffs had their origin in the imperial bracelets; the first reference to their use by ecclesiastics occurred in the 10th century. At first only bishops used them, but later the practice was adopted by priests, and, after the 15th century, the right to wear them was granted to deacons also. The mantle (*mandyas*) is a large flowing black cape joined at the neck and at the feet and is the required choir habit of monks. The bishops, all being monks, wear it with horizontal colored stripes introduced into the design and four squares of velvet ornamenting the panels where the cape joins. Small bells of silver are frequently attached to the bottom of the bishop's

mantle. The headgear, *kamilavka*—*kalimmathion* in Greek—and *skufya*, is in the former case a hat worn by all Greek clergy as a civil distinction (the Greek form has a shallow cone-shaped projection on the top), and by Slavic priests as a distinction granted by metropolitans; in the latter case (*skufya*), it is a pointed skull cap worn by the Slavs as a distinction. The *kamilavka*, when worn by one entitled to it, is draped with the monastic veil. The veil is black in the case of all except Slavic patriarchs and metropolitans, who substitute white for black. The patriarch of Moscow wears a special head covering which may best be described as similar to a round-topped white hood with two long lappets coming down on either side of the face; the portion covering the head is embroidered with a representation of one of the cherubim; the lappets have richly worked crosses at the bottom, and on the exact center of the top of the hood stands a jeweled cross. The panagia (*encolpion*) is the pectoral image which is the exclusive mark of a bishop. Anciently, it was a reliquary, but since medieval times it has been a crowned medallion of the Virgin and Child.

A number of vestments are characteristic of the West and have no counterparts in the official vestments of the East. The surplice is an 11th century amplification of the alb, made to be worn over the cassock. It is always of white and traditionally is supposed to reach nearly to the feet. A length of 10 inches from the ground was prescribed by 16th century directions. Its wide sleeves were designed both for convenience and warmth. From the 14th century on the surplice has been part of the habit of the clergy and of male choristers. An extremely abbreviated form of the surplice, popular on the continent of Europe, is known as a cotta.

The rochet is a development of the tunic which might best be described as the white linen cassock of dignitaries; it has been worn as such from the 13th century. Servers in England have worn it, but this dates from an earlier practice. From the 14th century on, the linen used became very fine, and the garment was somewhat shortened, but it still continued to reach below the knees until the 19th century. The cassock cuffs turned back over its sleeves to produce a finished effect. The frilled cuffs of linen seen in 18th century pictures were attached to the shirt worn under the cassock, ecclesiastical outfitters notwithstanding.

The cope is a ceremonial cape edged with fine decoration, called orphreys, and hooded with the material of the orphreys. It is generally considered to be descended from the paenula and is, therefore, in fact, another form of the chasuble. An all-black version of it, known as the *cappa nigra* or *cappa choralis*, is of ancient use in the church. Since the 13th century the decorated cope has become part of the official vestments of the West, even though it has never been confined to the use of clergy alone. The ornamental clasp which holds the top of the cape together is called a morse. The *cappa magna* is an ecclesiastical form of the doctor's cope. It is a cape entirely closed up the front save for an opening for the hands, and has a deep fur hood falling over the shoulders. The color ordinarily corresponds to the color of the cassock worn.

The chimere is a sleeveless mantle worn over the rochet and originally an outdoor garment. In the strict sense it did not become a vestment

until the 17th century. Whether known by this name or by its usual European name, mantelletta, it is ordinarily of one of three colors: scarlet, purple, or black.

The hood, the mozzetta, the almuce, and the tippet, or scarf, all have their origin in the ordinary medieval headgear worn in cold buildings. Prelates came eventually to have theirs made of fur or of rich material fur-lined, and the same distinctions between classes and faculties in the universities produced the system of academic hoods prevailing in Oxford and Cambridge. In brief, the hood is meant to cover the head and is closed at the neck; the mozzetta is an elbow-length cape buttoned up the front with a small hood attached in back; the almuce is a combination hood, shoulder cape, and scarf open down the front; and the scarf or tippet is a long, broad band of material worn around the neck to keep a hood in place.

The amice, which started as a protection for the neck, became a regular part of clerical attire in the 8th century. After the 12th century it was worn on the head, and is still, technically, the first garment put on over the cassock when eucharistic vestments are worn (there are certain occasions when it is worn with a surplice, but these are relatively rare). It is a square of white linen placed over the head and secured by strings which cross the breast and back and are tied when they again meet in the front. After all other vestments are put on, the hood thus formed is permitted to fall back. A scarf version of the amice is known as a fanon or orale.

The tunicle, which started as a shorter tunic to be worn over the alb by the inferior clergy, ended by being identical with the dalmatic in material and design, although occasionally somewhat less ornamented. The medieval pontificals direct that a bishop wear both tunicle and dalmatic under the chasuble.

The ring, worn by bishops by virtue of their office, dates as a custom from the 7th century. It has since then been worn on either the middle or fourth finger of the right hand. Most bishops do not follow the medieval requirements of three rings: a precious stone magnificently set, a less valuable edition for ordinary wear, and a seal ring. Cardinals, abbots, and doctors of certain faculties are granted rings in the Roman Catholic Church.

The headgear of the West is so different from that of the East that it must be treated separately. The early church, following St. Paul's injunctions, was violently opposed to any man wearing headgear in church. The ordinary pileus of the people was a simple round cap worn out of doors. In the 14th century this cap was taken over from the laity. Being made of four pieces, it gradually became square in shape and in this form has been preserved in the "square cap" mentioned in the Canons of 1604. On the continent of Europe the seams hardened into vertical projections; from this development comes the biretta. The hardening and projecting of the top surface of the square cap result in the mortarboard of academic dress.

Bands, the two rectangles of linen which are worn at the throat, are vestigial remains of the "falling band" collar popular in the 17th century; the sides of the original collar have gone, leaving only the front sections. The stock which bound them has, since the latter part of the 19th century, become the ordinary clerical col-

lar. Bands are common to most North European churches, and are ordinarily white, the exception being certain of the French clergy who continue to wear the white-edged black bands first used in mourning for Louis XIV. Some of the Scandinavian churches use ruffs; these ruffs date from the ordinary dignified attire of the latter portion of the 16th century.

There are a number of other items of somewhat restricted use: buskins and sandals, which are the liturgical knee-length stockings and the slippers worn on occasion by major prelates; pontifical gloves, adopted in the 12th century following the lay custom of the time—the episcopal ring is worn over the gloved hand when gloves are worn; and the cross-staff, borne before an archbishop, dating from the 5th century. The rationale, or episcopal breastplate, was a fanciful imitation of the high priest's breastplate; it came into fashion in the 12th century and was obsolete by the late 15th century.

Monastic dress in the West is ordinarily referred to as the habit. The habit includes a long, close-fitting tunic, over which is worn the scapular, a narrow tabard-like rectangle of cloth which hangs down the front and the back. Over these (though not always) is worn the pallium (gown) or cappa (cape). Lastly comes the caputium (hood). Monastic dress had its origin in the clothes of laboring people. There are over a hundred different combinations of these which are distinctive of the particular orders.

The vestments described above cover all those used by the Roman Catholic, Anglican, Lutheran, and Presbyterian churches. It is probably not necessary to point out that no one of these churches uses all the vestments listed.

Mention must be made of the several color sequences used by the liturgical churches. The East follows the ancient practice, which knew but two kinds, festival and penitential. The Roman Catholic Church uses white, red, violet, green, black, and rose. The Lutheran Church follows this same scheme (known as the Western Use), only excepting the use of rose. The Sarum Use (the Use of Salisbury Cathedral) includes "best," "second best," red, white, blue, black, and unbleached linen.

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EDWARD N. WEST,
*Canon of the Cathedral of St. John the Divine,
New York City.*

COSTUS, a product of an annual herb grown on the mountain slopes of the Kashmir (Cashmere) valley. The dried root of *Saussurea lappa* is commonly known as costus, and is mainly used as an ingredient of incense in the Orient. It is also employed as a protection against moths in bales of shawls and furs. The root yields a small amount of costus oil, which finds use as a fixative in perfumery and toilet products. Formerly as much as 2 million pounds of costus root were exported annually, but production appears to have declined in recent years.

COSWAY, Maria Cecilia Louisa Hadfield, Irish-Italian painter: b. Florence, Italy, 1759; d. Lodi, Italy, 1838. She studied art in Rome and then went to England, where she developed her skill as a miniaturist of mythological subjects. She exhibited at the Royal Academy of Arts in 1781 and in the same year married Richard Cosway (q.v.). She was a contributor to John Boydell's Shakespeare Gallery. Much of her life was spent on the continent. Thomas Jefferson, who met her during his stay in France, became greatly attached to her. In later years she established a school for young ladies at Lodi, and was made a baroness by Emperor Francis II. Her only child died at an early age.

COSWAY, Richard, English painter and miniaturist: b. Okeford, near Bampton, Devonshire, Oct. or Nov. 1742; d. Edgeware, July 4, 1821. He studied in London and from 1761 on contributed pictures to the various exhibitions there, showing for the first time at the Royal Academy of Arts in 1770. He was principal painter to the Prince of Wales and enjoyed an enormous and lucrative popularity as a fashionable portrait painter in aristocratic circles in Paris as well as London. Early in his career he had worked for jewelers, painting miniatures to adorn snuffboxes, and he is known today chiefly for his perfection of the technique of painting miniatures on ivory.

COT, kôt, 'Pierre Auguste, French painter: b. Bédarieux, Department of Hérault, 1837; d. Paris, Aug. 18, 1883. He studied under Léon Cogniet, Alexandre Cabanel, and Adolphe William Bouguereau. Among his works are *Spring Time* (Brooklyn Museum) and *The Storm*, often called *Paul and Virginia* (Metropolitan Museum of Art, New York City).

COTA DE MAGAQUE, kō'tā thā mā-gwā'kā, Rodrigo, Spanish poet: b. Toledo, Spain; d. before 1495. Jewish in religious background, he became a Christian and served the Inquisition in the persecution of other converted Jews. He was the author of the dramatic poem *Diálogo entre el amor y un viejo*, in which an old man is tempted by Love and, after long resistance and much argument, yields, only to find himself now the object of Love's ridicule. The dialogue, first printed in the *Cancionero general* of 1511, had an influence on the development of the drama and continues to be of interest for its poetic merit. Cota de Magaque also wrote a burlesque epithalamium (c.1472). Scholarship refutes his authorship of the first act of Fernando de Rojas' *La Celestina* and of the political satire *Coplas de Mingo Revulgo*, both of which have been attributed to him. He is sometimes called *el viejo*, the elder, to distinguish him from his nephew *el mozo*, the younger.

COTABATO, kō'tā-bā'tō, province, the Philippines. Located in the southern part of the island of Mindanao, it is bordered on the north by Lanao and Bukidnon provinces, on the east by Davao Province, on the south by the Celebes Sea, and on the west by Illana Bay and Moro Gulf. With its dependent islands it covers an area of 8,909 square miles. Mountains in the south and in the northern and eastern border regions include two volcanoes: Mount Apo, on the eastern boundary, at 9,689 feet the highest

mountain in the Philippines; and Mount Ragang, on the northern boundary. The Rio Grande de Mindanao, known in the northeast region as the Pulangi, crosses the province; in its course through the north central area it drains the Liguasan Marsh. The province is fertile but largely undeveloped, with rice, coconuts, and rubber grown. Moros comprise the bulk of the population. The capital is Cotabato, and the largest villages are Dulawan, Midsayap, and Talayan. Pop. (1948) 439,669.

COTE, Marc-Aurèle Suzor. See SUZOR-CÔTÉ, MARC-AURÈLE.

COTE D'OR, kôt'-dôr', department, France, formed of part of the old province of Burgundy. Located in east central France and having an area of 3,393 square miles, the department is bounded on the north by the departments of Aube and Haute-Marne, on the east by Haute-Saône and Jura, on the south by Saône-et-Loire, and on the west by Nièvre and Yonne. It is crossed by part of Langres Plateau, north of Dijon, and by the Côte d'Or mountain chain. Rivers include the Saône, in the southeast, the only navigable river; the Seine, which rises in the northwest and, together with its tributary the Ource, drains a large wooded district; and the Arroux, a tributary of the Loire. Anthracite mining is carried on, and there are large quantities of iron. Vineyards in the east yield the department's most important economic product, with the wines from Beaune and from the Saint-Georges vineyard of Nuits being best known. Other products include vegetables, cereals, and manufactured metal products. The department is divided into three arrondissements (Dijon, Beaune, and Monthard), 37 cantons, and 717 communes. The capital is Dijon. Pop. (1946) 335,602.

COTE D'OR (hill, or hillside, of gold), a chain of mountains in France which separates the basin of the Saône from the basins of the Seine and the Loire, and connects the Cévennes range with the Vosges range. The name has special reference to a small chain in the Department of Côte d'Or whose eastern slopes have vineyards famous for their excellent and valuable wine—hence the name Côte d'Or. The chain, about 31 miles in length and averaging 1,500 feet in altitude, extends northeast from the Nolay-Chagny area in the south of the department to Dijon in the east central region.

COTENTIN PENINSULA, region of Normandy, northwest France, projecting into the English Channel across from the Isle of Wight. It forms the northern part of the Department of Manche. Once a Norman county, it takes its name from its former capital, Coutances. Cherbourg, the principal city, has the only good harbor. The countryside is characterized by rolling terrain, hedgerows, small fields, and apple orchards. Livestock-raising and dairying are important occupations. Allied forces invaded the peninsula on June 6, 1944. (See WORLD WAR II.)

COTES, kôts, Roger, English mathematician: b. Burbage, Leicestershire, July 10, 1682; d. Cambridge, England, June 5, 1716. He was educated at St. Paul's School and at Trinity

College, Cambridge, where, in 1706, he became first Plumian professor of astronomy and natural philosophy. In 1713 there appeared a new edition of Newton's *Principia*, thoroughly revised by the author with the assistance of Cotes and containing a preface by the latter which defended Newton's system against the Cartesians and others. Cotes published only one independent work, a treatise on ratios entitled *Logometria* (1713). After his death Robert Smith, his successor as Plumian professor, edited *Harmonia Mensurarum, sive Analysis et Synthesis per Rationum et Angularum Mensuras: Accedunt alia Opuscula Mathematica per Rogerum Cotesium* (1722) and his *Hydrostatical and Pneumatical Lectures* (1738). The latter was translated into French by Pierre Charles Lemonnier in 1740. Cotes did pioneer work in practical astronomy; his description of the meteor of March 6, 1716, was published in 1720. His name is still given to a theorem discovered by him relative to the circle. The correspondence of Newton and Cotes was published in 1850. Newton is reported to have once said, "Had Cotes lived we might have known something."

COTES, Sara Jeannette Duncan, Canadian author: b. Brantford, Ontario, 1862; d. Ashmead, England, July 22, 1922. She entered journalism as a correspondent for several Canadian and American newspapers at the Cotton Centennial in New Orleans in 1884-1885, and later, writing under the pseudonym Garth Grafton, served on the staffs of the *Washington Post*, the *Toronto Globe*, and the *Montreal Star*. In 1891 she married Everard Cotes and accompanied him to India, where she spent most of her later life. Her novels, marked by humor, include *A Social Departure* (1890); *An American Girl in London* (1891); *Those Delightful Americans* (1902); *The Imperialist* (1904); *His Royal Happiness* (1915); and such stories of Indian life as *The Simple Adventures of a Mem Sahib* (1893) and *The Story of Sonny Sahib* (1894).

COTES-DU-NORD, kô't'du-nôr', department, France, forming part of ancient Brittany. Located in northwestern France, it is bounded on the north by the English Channel, east by the Department of Ile-et-Vilaine, south by the Department of Morbihan, and west by the Department of Finistère. The department has an area of 2,787 square miles. The much indented coast has many shoals and small offshore islands. The interior has poor soil and is generally level despite low mountains in the south and west. Streams flowing toward the English Channel are short ones such as the Rance and the Trieux; there are longer streams flowing south. Cattle and horses are raised, and principal agricultural products include fruit, flax, hemp, and grain. The department's fishing industry has declined somewhat, as has its linen and sail-cloth industries. Côtes-du-Nord is divided into four arrondissements (Dinon, Guingamp, Lannion, and Saint-Brieuc), 48 cantons, and 390 communes. The capital is Saint-Brieuc. Pop. (1946) 526,955.

COTGRAVE, kô't'grāv, Randle, English lexicographer: b. Cheshire; d. 1634?. He entered St. John's College, Cambridge, in 1587. Later he became secretary to William Cecil, 1st Baron Burghley. When, in 1611, he published

his French-English dictionary he dedicated it to Burghley. The dictionary, Cotgrave's sole reason for being remembered, was the first of its kind. It was remarkably accurate and reliable for its time, and has been several times reissued. A storehouse of 16th-17th century English and French forms, it has been of great value to linguistic researchers. Cotgrave's life remains otherwise obscure. It is known that he was still alive when the second edition of his dictionary was published, in 1632.

COTHURNUS. See BUSKIN.

COTILLION or **COTILLON**, both kô-tîl'yün, a ballroom dance originating in an English country-dance called the round for eight and transformed by the French in Louis XIV's reign. Cotillon means "petticoat" and apparently was adopted as the name for the dance from the words of a song popular at the time. In its French transformation originally requiring the dancing of a number of figures in somewhat classical style, the cotillion became, as it developed, a brisk, spirited dance, resembling the quadrille, which superseded it. It was popular in 19th century England and America. Danced to waltzes, polkas, and mazurkas, it permitted for an unlimited number of couples following a leading couple in an elaborate series of steps and figures, and successively changing partners. In time the cotillion came to be the dance closing a grand ball. The distribution of a variety of small gifts to the assemblage was one of its features.

COTIN, kô'tân', Charles, French abbé and poet: b. Paris, 1604; d. there, 1682. Attached to the court as a councilor and almoner, he frequented the fashionable salons, including the Hôtel de Rambouillet. In 1655 he was elected to the Académie Française. His poems and other literary works appeared as *Recueil d'Enigmes* (1646), *Oeuvres Mêlées* (1659), and *Oeuvres Galantes* (1663-1665). The poems were marked both for their mediocrity and their preciousness. Derided in the satires of Nicolas Boileau-Despréaux, Cotin replied in *La Critique Désintéressée* (1666). He acquired another enemy in Molière, who introduced him on the stage in *Les Femmes Savantes* and exposed him to ridicule under the name Trissotin (originally written as Tricotin). He was a successful preacher, and he had extensive knowledge in Oriental and classical studies.

COTINGIDAE, kô-tin'jī-dē, a family of almost 100 species of passerine birds, the cotingas, allied to the American flycatchers, and inhabiting the forests of tropical America. One species, the rose-throated becard, reaches the southwestern United States. The cotingas are of moderate size; they usually frequent tall trees and feed on such creatures as insects and snails and on berries and other small fruits. The plumage is sometimes plain rufous, green, or gray, the females being nearly always dull, although many of the males are very brilliant and some species are extraordinary among forest birds in being pure white. The cotingas include some celebrated South American species, such as the bellbird (q.v.), umbrella bird (q.v.), and cock of the rock. Many of them are ornamented with wattles and long plumes, which they display

in elaborate courtship postures and dances. The voice of the bellbird and some of the other cotingas is powerful and occasionally musical.

DEAN AMADON.

COTMAN, kōt'mēn, John Sell, English landscape painter and etcher: b. Norwich, England, May 16, 1782; d. London, July 24, 1842. Although his work was not considered of great importance in his own day, he subsequently became recognized as one of the leading figures of the Norwich school. He was an excellent draftsman, and painted well in both oils and water color. He published several volumes of excellent architectural etchings made in Norfolk and Normandy.

Two of his sons, MILES EDMOND (1810-1858) and JOSEPH JOHN EDMOND, were landscape painters of merit, and his nephew, FREDERIC GEORGE COTMAN (1850-1920), achieved distinction as a water-color artist.

COTO, or **COTO BARK**, kō'tō, the reddish-brown, aromatic, and slightly bitter bark from various South American sources, one of which being *Palicourea densiflora*, order Rubiaceae. It contains the substance *Cotoin*, $C_{14}H_{12}O_4$, which has been used in the treatment of intestinal disorders.

COTONEASTER, kō-tō-nē-ās'tēr, a genus of plants of the natural family Rosaceae, closely related to *Crataegus*, with fruit consisting of bony carpels, each containing two similar ovules. In the United States and England it is an ornamental shrub, having bright red fruit which remains throughout the winter. It thrives in any good, well-drained garden soil not too shadily situated.

COTONOU or **KOTONU**, kō-tō-nō', seaport, French West Africa, in Dahomey, 15 miles west-southwest of Porto-Novo. It is an export and manufacturing center for a rich agricultural region. Its harbor is poor but it is on a railroad and has an airport. Pop. (1949) c.22,900.

COTOPAXI, kō-tō-pāk'si, the most remarkable volcanic mountain of the Andes, in Ecuador, 30 miles south of Quito. It is 19,498 feet in height and its upper portion forms a perfect cone, permanently snow-covered on the eastern side, its side kept bare by the moist trade winds of the Atlantic. On the southern slope is a bare cone called *El Picacho* ("the beak") or *Cabeza del Inca* ("the Inca's head").

Many devastating eruptions have occurred, the earliest recorded in 1532, the latest in 1903. In 1698 the eruption destroyed the city of Tacunga, three fourths of its inhabitants, and surrounding settlements; in 1744 its roarings were heard as far as Honda, on the Magdalena River, 600 miles distant. The peak was climbed by Wilhelm Reiss in 1872 and explored by Edward Whymper in 1880.

COTSWOLD. See **SHEEP**—*The Mutton Type*.

COTSWORTH, Moses Bruines, English advocate of calendar reform: b. Willitott, Yorkshire, Dec. 3, 1859; d. Vancouver, British Columbia, Canada, June 4, 1943. In 1922 he organized the International Fixed Calendar League in

an effort to have the 13-month calendar devised by him adopted throughout the world. Placed before the League of Nations in 1931, his proposal was tabled until 1935, at which time international affairs were too pressing for it to receive consideration.

Cotsworth proposed a fixed calendar of 13 months of 28 days each, the 13th month to be called "Sol" and to come between June and July; an odd "Year Day" was to be added to December; and a like addition to be made to June, also without a weekday name, for leap year.

COTTA, kōt'ä, the name of a family of German publishers, which included the theologian, Johann Friedrich Cotta (1701-1779) of the University of Tübingen, as well as the proprietors of the J. G. Cotta'sche Buchhandlung. This publishing house was founded by JOHANN GEORG COTTA (1631-1692), who took over the management of the bookselling firm of Philipp Braun in Tübingen in 1659, and established the business which later bore his name.

JOHANN FRIEDRICH, BARON COTTA VON COTTENDORF (1764-1832), the great-grandson of the latter, was born in Stuttgart where his father, Christoph Friedrich Cotta (1730-1807), had established a printing house at the court. Taking over the leadership of the firm in 1787, Cotta embarked on a publishing career which played an important part in the distribution of German literature and ideas in his time. Among the many periodicals issued by him were the *Allgemeine Zeitung*, planned in 1793 with Schiller and first appearing in 1798 in Tübingen, and the *Horen*, notable for its role in the lives of Schiller and Goethe. Inaugurated in 1795 by Cotta and Schiller, this publication brought Cotta in close contact with Goethe, Herder, Fichte, and other great German writers who contributed to this venture. Although renowned as a bookseller, Cotta also was noteworthy as a liberal statesman and a champion of scientific agriculture, and for installing the first steam printing press in Augsburg.

JOHANN GEORG, BARON COTTA VON COTTENDORF (1796-1863), the son of the preceding, succeeded his father to the publishing business in 1832. He extended the activities of the firm by purchasing publishing houses in Leipzig and Landshut. However, under his son, Karl von Cotta (1835-1888), these connections were eventually relinquished and after his death the firm was sold to Adolf and Paul Kröner of Stuttgart (1889).

COTTAGE GROVE, town, Oregon, in Lane county, 21 miles south of Eugene on the coast fork of the Willamette River. It is served by the Southern Pacific Railroad and U.S. Highway No. 99. A growing trading center of a rich agricultural region, it is a lumbering, stockraising, dairying, and fruitgrowing community. The Bohemia Mountain Mining District and Cottage Grove and Dorena dams are nearby.

Cottage Grove was first settled in 1880 and incorporated in 1900. It is governed by mayor and city council. Pop. (1950) 3,536.

COTTER'S SATURDAY NIGHT, *The*, a poem written by Robert Burns while farming and writing poetry at Mossgiel, his brother's farm near Mauchline, Scotland in 1785. Although of hybrid origin—the plan and title suggested

by Robert Fergusson's *Farmer's Ingle*, the scene and sentiment reminiscent of Gray and Goldsmith, the form a medley of English and Scottish idiom in Spenserian stanza—the poem is original in inspiration and spirit. The poet's brother Gilbert tells us that "the Cotter is an exact copy of my father in his manners, his family devotions, and exhortations." Burns has pictured with genuine affection the home-coming of "the toil-worn Cotter" and his bairns, the welcome to the "neibor lad," "the cheerful supper," the family worship around the ingle. This homely realism and sincerity of feeling have given the poem an enduring place in English literature. Modern readers may find both forced sentimentality and artificial poetry in those stanzas in which Burns wholly abandons his native idiom, and with it his poetic instinct, to praise simple love and piety and denounce villainy and religion's pomp. But no one can fail to feel, in the scene itself and in the final stanzas, that truest love of country that is love of man. It is this humanity that has made Burns not only "the patriot-bard," but the poet of democracy, and *The Cotter's Saturday Night* not only a Scottish interior, but an idyl of the people.

COTTET, kô-tě', Charles, French landscape and genre painter: b. Le Puy, Haute-Loire, France, July 12, 1863; d. Paris, Sept. 25, 1925. He studied under Pierre Puvis de Chavannes and Alfred Philippe Roll. At first an impressionist, he later helped found the Société Nationale des Beaux-Arts. He was known chiefly as a painter of Breton subjects. A cycle of 10 landscapes entitled *The Country of the Sea*, several of which are in the Luxembourg, attracted wide attention. He painted many Venetian, Egyptian, Algerian, and Spanish subjects. There are also a few Icelandic landscapes by him. His paintings include *The Port of Camaret* and others in the Luxembourg; *Going to Church in Brittany* (Vienna); *A Moonlight Night* (Philadelphia); *Breton Women in Mourning* (Cincinnati); he is represented also in Buffalo and Providence. He was an officer of the Legion of Honor.

COTTIER TENURE, kôt'î-ēr, a system of tenure according to which laborers could rent small portions of land directly from the owner, or from a farmer, often giving personal service as part of the rent, and holding by annual tenancy. Later the term "cottiers" was used to denote peasant farmers whose rent was determined by competition. Ireland was the chief home of this system. The same class was called "crofter" in the west of Scotland. The enactment of land laws by Parliament eliminated some of the worst features of this system, and Irish independence helped correct abuses in that country.

COTTIN, kôt-tăn', Marie (called SOPHIE; nee RISTEAU), French novelist: b. Paris, France, March 22, 1770; d. Champlan, April 25, 1807. Her best-known work is *Élisabeth ou les exilés de Sibérie* (1806), which was imitated by Xavier de Maistre in *La jeune Sibérienne*. It was translated into English by G. R. Lockwood (New York 1869). Other novels are *Claire d'Albe*; *Malvina*; *Amélie de Mansfield*; and *Mothilde*.

Consult Kavanaugh, Julia, *French Women of Letters* (Leipzig 1862).

COTTLE, kôt'l, Joseph, English bookseller and author: b. Gloucestershire, England, 1770;

d. Bristol, June 7, 1853. The earliest poems of Robert Southey and Samuel Taylor Coleridge were published by him, and they acknowledged their indebtedness to him in later life. He also published Coleridge's periodical, *The Watchman* and *Lyrical Ballads of Coleridge and Wordsworth*.

His own writings include *Malvern Hills*; *John the Baptist*; *Alfred, an Epic Poem*; and *The Messiah*. Cottle's poems and those of his brother Amos are satirized in Lord Byron's *English Bards and Scotch Reviewers*. A prose work, *Early Recollections*, is in bad taste, though it has some details of value regarding Coleridge's early life.

COTTON, kô-tôn', Aimé Auguste, French physicist: b. Bourg-en-Bresse, Oct. 9, 1869. After studying at the lycées of Bourg and Clermont-Ferrand he matriculated at the École Normale Supérieure (1889) where J. B. Perrin and Paul Langevin were fellow-students. Awarded a scholarship in the physics laboratory in 1893, he advanced regularly in the university hierarchy, was associate professor at Toulouse, and from 1900 to 1915 was professor at the École Normale. After World War I he held the chair of physical research at the Sorbonne, was elected to the Academy of Sciences in 1923 and became its president in 1947. With H. Mouton he discovered double refraction of liquids in a magnetic field, and with Pierre Weiss made an important deduction from the Zeeman effect (q.v.). He is the author of *Le Phénomène de Zeeman* (1900); *Les Ultra-microscopes et les objets ultra-microscopiques* (1906); and *Symétrie des critères et symétrie moléculaire* (1914).

COTTON, Charles, English poet and translator: b. Beresford, Staffordshire, England, April 28, 1630; d. Westminster, London; burial date, Feb. 16, 1687. In 1658 he inherited his father's estate on the Dove River, on the banks of which he built a fishing house in which he frequently entertained his friend Izaak Walton. His writings included *Scarronides, or Virgil Travestie* (1664; 1670), the first and fourth books of Virgil's *Aeneid* in burlesque; and a translation of Montaigne's *Essays* (1685), his best work. He also translated a tragedy of Corneille, *Horace* (1671). A volume of his *Poems on Several Occasions* was published posthumously. He is best remembered for his addition to the fifth edition of Walton's *Compleat Angler* (1676) called "Instructions How to Angle for a Trout and Grayling in a Clear Stream." His poetry won praise from Charles Lamb and William Wordsworth.

COTTON, John, American Puritan clergyman: b. Derby, England, Dec. 4, 1584; d. Boston, Mass., Dec. 23, 1652. The son of Roland Cotton, a well-to-do lawyer, he became a student at Trinity College, Cambridge, and was awarded the A.B. degree in 1603 and A.M. in 1606. Proficiency in Hebrew won him a fellowship at Emmanuel College, which had been founded by a Puritan and was the most Puritanically inclined of all the Cambridge colleges. Ordained deacon and priest in 1610, he received the B.D. degree three years later. Meanwhile, in 1612, he had been chosen vicar of St. Botolph's Church in Boston, Lincolnshire. His gradual abandonment of Church of England forms of worship began about 1615. During his 20-year tenure of the vicarage he gained a reputation as a brilliant

preacher and controversialist, and inclining in his doctrines and practices toward the Puritan form of worship. Cited to appear before the Court of High Commission in 1632, he sought safety in flight, arriving in Boston on Sept. 4, 1633. On October 10, he was ordained teacher of the church there, an office he held until his death. He attained great influence in the Massachusetts Bay Colony. He was a critic of Greek, wrote Latin with elegance, and could speak Hebrew. His sermons were noted for their simplicity and effectiveness. During the course of his celebrated controversy with Roger Williams he published *The Keyes of the Kingdom of Heaven* (1644) and *The Bloudy Tenent, Washed, and Made White in the Bloud of the Lambe* (1647). He maintained that the church is constituted of elders and brethren, and that the elders are entrusted with government insofar as admissions and excommunications are concerned, but that nothing of common concern can be imposed upon the brethren against their consent. He defended the interference of civil power in religious matters for the support of truth, maintaining the duty, for the good of church and people, of putting away those who after repeated admonitions persist in rejecting fundamental points of doctrine or worship. Cotton published more than 50 works, including *An Abstract of the Lawes of New England* (1641); *The Way of Life* (1641); *The Way of the Churches of Christ in New-England* (1645); *Milk for Babes* (1646), his famous children's catechism; *The Way of Congregational Churches Cleared* (1648); *The New Covenant* (1654); and *The Covenant of Grace* (1655).

Consult *The Writings of Roger Williams*, vols. 1-4 (Providence 1866-1870); Walker, Williston, *Ten New England Leaders* (New York 1901); Parkes, H. B., "John Cotton and Roger Williams Debate Toleration, 1644-1652," *New England Quarterly*, 4:735-56 (1931).

COTTON, Sir Robert Bruce, English antiquary: b. Denton, Huntingdonshire, Jan. 22, 1571; d. May 6, 1631. He was educated at Westminster School and Cambridge University, receiving his B.A. degree in 1685. Settling in London, he devoted himself to antiquarian studies and to the collection of ancient manuscripts pertaining to English history. The Antiquarian Society met at his home, and he opened his library to William Camden, John Speed, Sir Walter Raleigh, Ben Jonson, and Francis Bacon. He sat in Parliament under James I, who made him a baronet in 1611, and he was a member of the first and third Parliaments of Charles I's reign. He was opposed to the growth of royal power, and in 1629, falsely accused of having written an obnoxious political tract, was imprisoned for eight months. Although he was pardoned, his library was confiscated. Of his many works, only two—*The Raigne of Henry III* (1627) and *The Dangers wherein the Kingdom now standeth* (1628)—appeared in his lifetime. A collection of 14 of his tracts, *Cottoni Posthuma*, was published by James Howell in 1657. See also COTTONIAN LIBRARY.

COTTON. Cotton in the botanical sense refers to the plant which has long been famous for its fluffy fiber, and for many decades for both its fiber and its seed. Cotton fiber, which is also referred to merely as cotton, consists of unicellular hairs varying in length from a fraction of an inch to two inches or slightly more. The fibers are attached to a seed about the size of a

small pea and have a spiral twist that makes them especially valuable for spinning—by far their most important use. Cottonseed, long considered almost worthless (except for planting purposes) after the lint or fiber had been removed, is now highly valued for its oil, cake, meal, and linters (see separate article on COTTONSEED AND COTTONSEED PRODUCTS).

The history and importance of cotton, its characteristics, production, marketing, manufacture, and economic problems, are discussed under the following headings:

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| 1. Historical Background and Importance | 5. Production, Supplies, and International Trade |
| 2. The Cotton Plant | 6. Manufacturing and Textile Distribution |
| 3. Production and Ginning Practices and Facilities | 7. Economic Problems |
| 4. Marketing and Prices | |

1. HISTORICAL BACKGROUND AND IMPORTANCE.

The origin of cotton and the country where it was first used have never been definitely determined. It has long been indicated, however, that cotton cloth was being produced in India as early as 1500 B.C., and that about 1500 A.D. India was perhaps the center of the cotton industry. In the 1920's, archaeological evidence was discovered indicating that as early as about 3000 B.C. cotton was being used in India to make fabric and string. From India the culture of cotton and the making of cotton cloth are believed to have spread to Persia (Iran), China, and Japan. In the last two countries vested interests in silk actively opposed the use of cotton.

The writings of Herodotus and Pliny report that cotton fiber was known to the Greeks and Romans. Columbus found it employed by natives of the New World. In the conquest of Mexico and Peru cotton cloth was discovered to be in use, and ancient Peruvian tombs have yielded mummy cloths of cotton. In the early years of the Christian era mummy cloths from Egypt are said to have been made of linen, but there are other indications that the Egyptians used cotton cloth in the same period.

Before the Industrial Revolution most of the yarn cloth produced throughout the world was either handmade or made with very crude equipment. In the second half of the 18th century many new machines for making cloth were invented in England. Since the use of these machines was most efficient when they were established in large units, the factory system of manufacture was developed.

The English inventions of textile machinery were very carefully guarded. No drawings of the machines were permitted, and workers were forbidden to disclose how they operated. In 1789, however, Samuel Slater (q.v.) brought to the United States a working knowledge of the textile machinery of Great Britain, which he had gained as an apprentice under Jedediah Strutt, partner of the inventor Sir Richard Arkwright. He had the machinery reproduced from memory and in 1793 built at Pawtucket, R. I., the first cotton mill in the United States. See also TEXTILE MACHINERY.

Economic Importance.—Cotton is one of the most valuable of all plants. Over the years it has returned to farmers in the United States more cash annually than any other crop. In 1950, for example, cash income from the cotton crop, including both lint and seed, totaled \$2,473,106,000, as compared with \$1,812,116,000 from wheat,

the next most important cash crop. The farm value of the corn crop is considerably larger than that of cotton, but much of this crop is not sold but used for feed on the farms where it is produced.

More United States citizens depend on cotton for an important source of their income than on any other crop. It has been estimated that from 12,000,000 to 14,000,000 persons in the United States depend directly on this crop for at least a part of their livelihood. On some 1,500,000 cotton-producing farms there are 9,000,000 or 10,000,000 persons—approximately one third of the farm population of the United States—who rely on cotton for a considerable part of their income. About 3,000,000 or more persons derive their income from cotton textile and garment manufacturing, and cotton warehousing, ginning, distributing, and marketing employ an estimated 500,000 persons.

In addition to those directly dependent on cotton and the cotton industry, millions of persons throughout the United States are vitally affected by cotton. They include persons engaged in the manufacture, wholesaling, transportation, and retailing of commodities made by other industries and sold to those who produce, merchandise, transport, and manufacture cotton. Also included are bankers, physicians, lawyers, and others performing professional or personal services.

The importance of the cotton plant is due to the many uses of its fiber and its seed. The uses of cotton fiber are so varied that it is by far the most important of all textile fibers. In fact, cotton provides more cloth for mankind than all other fibers combined. During the period 1935-1939, cotton accounted for slightly more than half, by weight, of all fibers used in the world. Jute, the next most important fiber, supplied less than 15 per cent of the total. Despite the increased consumption of synthetic fibers during and after World War II, cotton probably still accounted for at least half the world's fiber consumption in 1952.

Because of the expanding consumption of man-made fibers, cotton's relative importance as an apparel fiber has declined. In 1929 cotton accounted for 84.83 per cent, by weight, of the United States consumption of apparel fibers (cotton, wool, rayon, flax, and silk). By 1939 cotton's share had decreased to 79.68 per cent of the total, and by 1949 to 71.86 per cent. (See also section on *Economic Problems*.)

During World War II cotton was called America's No. 1 crop because it met so many vital war needs. For each of the millions of 478-pound bales of lint cotton produced in the United States, almost 900 pounds of cottonseed were produced. From the fiber were manufactured some 10,000 items of clothing, shelter, and fighting equipment for the army—ranging from socks to fabrics for airplane tires and bulletproof gasoline tanks, from balloon fabrics to parachutes, from mosquito netting to camouflage screens for army installations. Cotton fiber also supplied farmers, war plant workers, and other civilians with such essentials as bags for food products, clothing, and hospital supplies, and furnished war and other industrial plants with fabrics and other parts for the products which they manufactured. Cottonseed supplied high-grade vegetable oil for food; protein feed in the form of meal and cake for livestock; hulls for livestock roughage and

chemical uses; and linters for smokeless powder, plastics, and other essential products.

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(M.R.C.)

2. THE COTTON PLANT. The cotton of commerce is a product of plants of the genus *Gossypium*, a member of the Malvaceae or mallow family. There are many different species of *Gossypium*, but almost all cotton of commercial importance falls into three separate or closely related species. The most important of these is *Gossypium hirsutum*, which includes those cottons developed in the United States from cotton native to Mexico and Central America and commonly known as upland cottons. A second botanical species, of early South American origin, is *Gossypium barbadense*. Generally of longer staple than upland cottons, it includes Egyptian, American Egyptian, and Sea Island cottons and some of the Peruvian and Brazilian varieties. A third group embraces those short-staple cottons native to India and the Far East which are classified as *Gossypium arboreum* and *Gossypium herbaceum*. All the species are said to be of tropical origin.

Upland cottons (*G. hirsutum*) have unspotted white flowers, bolls of four or five locks, and seeds usually well covered with white, brown, or green fuzz in addition to the lint. This type of cotton constitutes a very large part of the United States crop, as well as substantial proportions of the crops of many other countries in both hemispheres, including Argentina, Brazil, China, Mexico, and the Soviet Union.

The cottons classified as *G. arboreum* and *G. herbaceum* are quite closely related botanically. They include many types (formerly designated as species) of cotton sometimes referred to as Asiatic. Short in staple but strong and rather rough, this cotton constitutes most of that grown in India, Iran, parts of China, and some other Asian countries producing smaller quantities.

Cottons of the species *G. barbadense* have yellow flowers with purple spots, bolls mainly with three locks, and black seed from which the fibers are easily detached. The fibers are generally longer in staple than those of almost any of the upland cottons.

Climatic Requirements.—Cotton is a warm-weather plant. For the most part, it is grown commercially in areas with 200 or more days a year free of frost and with a temperature of 70°F. or more during a considerable part of this period. In many parts of the United States cotton belt, the normal monthly mean temperature from May through September is from 70° to over 80°F. Cotton does best in areas where there is plenty of sunshine without prolonged periods of cloudy weather. This is especially true where the boll weevil is present, since it is particularly hard to control this important insect pest when there is much dull, cloudy weather (see section on *Production and Ginning Practices and Facilities*).

Because it requires so long a growing season, cotton is produced almost entirely between lati-

tudes 40°N. and 30°S. In the United States the cotton belt is mainly south of latitude 37°N. In the Soviet Union, however, cotton has been produced as far north as latitude 41°-42°N., or about the same latitude as Chicago, Ill.

Except for areas where the land is irrigated, the cotton plant requires a fair amount of rainfall. It can be grown on unirrigated lands with about 20 inches (or even less) of annual rainfall, or 7 or 8 inches distributed over the growing season. In areas with heavy rainfall throughout the year, cotton does not do so well. In the United States annual precipitation—including rain, hail, sleet, and snow—generally ranges from 40 to 60 inches in the eastern and central parts of the rain-grown sections of the cotton belt to as low as 20 inches in parts of Texas and Oklahoma. In the eastern and central states of the cotton belt, precipitation during the autumn or harvesting period is considerably lighter than in other seasons. Except for their eastern sections, Texas and Oklahoma have a greater average precipitation during the harvesting season than in winter, but it is still less than in most other cotton-producing states.

In tropical regions the growing season of the cotton plant is controlled by moisture or other conditions rather than by frost, as it is in the temperate zone. Here cotton may grow for years, the plant becoming so large that it is referred to as tree cotton. In Peru commercial production of cotton is confined almost entirely to irrigated valleys where much of the cotton is allowed to produce three or four crops from one planting, the plants being cut back to the ground after each crop. As a result of variation in the time of cutting or planting and of control of the water supply, cotton is harvested in Peru on a sizeable scale almost all the year round.

Largely because of wide variation in climatic conditions, harvesting times in several other countries also differ greatly from those in the United States—a significant factor in cotton marketing. When the United States crop is moving to market in greatest volume, from September to December, an important part of the Indian crop is being planted. In southern Brazil, where large quantities of cotton similar to that grown in the United States are produced, harvesting occurs between March and July. In Argentina the crop is only slightly earlier. In the major producing countries of China, the Soviet Union, and Egypt, as well as in a number of countries producing smaller quantities, including Mexico and Turkey, harvesting dates do not differ materially from those of the United States.

Soil Requirements.—When climatic conditions are favorable, cotton may be produced on almost any type and character of soil. It is grown on light, sandy soils, on loams, on heavy clay, and on bottom lands. Yields on the different types of soil, however, vary substantially. On light, sandy soil, unless it is well fertilized, the yield is small. On loams the yield is better, while on bottom lands the yield is normally very good when moisture conditions are favorable.

The most productive soils in the United States outside the irrigated areas are the black, brown, or red well-drained bottom land soils along the rivers and smaller streams of the cotton belt. On somewhat similar soils in the dry but irrigated areas of the southwestern part of the United States, yields per acre average much higher than in other areas of the belt. This is

due not only to the soil, but also to controlled moisture conditions and to smaller damage from insects and diseases, which are checked to a greater extent as a result of climatic conditions. The dark-colored clay lands, such as the black prairie areas of Texas and Alabama, the sandy loams of the coastal plains, and the red subsoil Piedmont lands are also important cotton-producing soils.

Soils, together with moisture conditions (which are affected to an important extent by soil types), have a major bearing on the quality of cotton produced. The rich valley of the Nile River, where moisture conditions are generally quite favorable, has long been noted for its production of long-staple cotton. A very large part of the long-staple cotton produced in the United States is grown in the fertile river bottoms and in irrigated areas. Sandy upland soils normally produce short-staple cotton, particularly if there is an inadequate supply of moisture in the soil. A scarcity of soil moisture will affect adversely the length of the cotton fiber and the fiber yield per acre on all types of soil.

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(M.R.C.)

3. PRODUCTION AND GINNING PRACTICES AND FACILITIES.

In this section are discussed (1) production and ginning practices and facilities, cotton varieties, and insect pests and cotton diseases in the United States; and (2) production and ginning practices and facilities and cotton varieties in other cotton-producing countries.

THE UNITED STATES

Cultural Practices.—Because of variations in size of farms, topography, soil, climate, economic position of owners or operators, individual preferences and past experiences of farmers, and other factors, methods of cultivating cotton in the United States differ materially from area to area and from farm to farm. There are differences in the farm machinery used, crop rotation, width of rows, spacing of plants in the rows, type and amount of fertilizer used, frequency of hoeing and cultivating, varieties grown, and insect and disease control practices. On some farms, particularly in hilly sections, and on some plantations where tenants and sharecroppers are employed, all cultivating may still be done with one-horse, half-row equipment requiring a great deal of man-labor and horse-work per acre. On other farms almost all operations, including harvesting, may be done with large-scale mechanical equipment. On the high plains of Texas and in some of the coastal plains areas, in the Mississippi Delta, and in the irrigated areas of the Far West, cultivation on a good many farms is performed with four-row equipment requiring comparatively few man-hours, machine-hours, and tractor-hours.

Irrespective of the exact procedures followed, there are several operations common to most farms and most areas of the cotton belt. These include preparation of the seedbed, planting, chopping or hoeing (including thinning), and cultivation and hoeing of the growing plant. On many farms, especially east of the Mississippi, the application of commercial fertilizers is an-

other major operation involved in producing a crop. Also important in the humid areas are the practices followed in combating insect pests and diseases.

After the cotton is harvested, the land may be planted to legumes or some other crop in the late fall or early winter, but usually it remains idle until the following spring. In fact, some cotton may not be harvested until December or even January, although about 90 to 95 per cent of the crop is normally ginned by December 1. Whether or not the land is put to use shortly after the crop is harvested, the cottonstalks, especially if they are of any considerable size, are usually crushed with a stalk cutter or by some other method before the operator is ready to prepare the land for the new crop. In areas where stalks make a very limited growth, no cutting is necessary before the initial breaking or plowing of the land.

Planting normally begins early in March in the extreme southern part of the cotton belt, and about the middle of May in its northern limits. In a given area most of the planting is completed within a period of one month. In all sections of the belt, planting is done in rows, the seed being either drilled in or dropped in hills, which are usually 8 to 20 inches apart. The operation is performed by planters varying from one-row, horse-drawn types to four-row equipment that is usually drawn by a tractor. In drilling, the planter is ordinarily adjusted so that the seed is spread more or less continuously with little or no space between the individual seeds. In this case, the plants are usually chopped—that is, cut out with a hoe—leaving one or more plants per hill. Depending on the weather, soil condition, time required for the plants to reach a height of two to four inches, and availability of labor, chopping is customarily done within three to five weeks after planting. Many farmers plant the cotton in hills in order to reduce the amount of hoeing required, even though hoeing and thinning are practiced. If the season is unfavorable and the seed has grown to an unsatisfactory stand, replanting is often necessary.

After chopping, the cotton is usually cultivated in order to keep down grass and weeds and maintain the proper condition of the soil. It may then be necessary to hoe the cotton once or twice to keep the grass and weeds under control; in this case, the crop is cultivated shortly after being hoed. Where hoeing is unnecessary, the crop is generally cultivated at least once or twice, and sometimes three or four times, after the cotton has been chopped or otherwise thinned. The final cultivation prior to harvesting, often called "laying by the crop," usually occurs some four to six weeks before harvesting begins. This is about July 1 in the extreme southern states of the belt and early in September in its upper limits.

To a limited extent in some level areas, cotton is cross-cultivated, the plants being spaced at uniform intervals equal to the width of the rows. This practice greatly reduces and sometimes eliminates hoeing. Cross-cultivated cotton may either be planted in hills at the desired intervals or drilled in and thinned by plowing out the surplus plants.

Harvesting.—A very large percentage of the United States cotton crop is hand picked, the seed cotton being picked from the open boll. Another method, called hand snapping or pulling, has been used for some years in parts of Texas

and Oklahoma and to a very limited extent elsewhere. This process involves snapping or pulling the entire bolls instead of picking the locks of cotton and leaving the burrs on the plants.

After years of experimentation, mechanical harvesters are being used to an increasing extent. They are of two general types: one which strips off the bolls, leaves, and a certain amount of stems, and one which picks the lint from the open boll. There is considerable optimism among manufacturers of mechanical harvesters and others regarding the increased production and sale of such machines. They expect that, especially on large farms and plantations, such as those in the Mississippi Delta, the high plains and coastal plains of Oklahoma and Texas, and irrigated areas, most cotton harvesting will eventually be performed by some type of machine requiring very little man-labor. Since chopping and harvesting normally constitute a very large percentage of the labor required to produce cotton, the use of a successful mechanical harvester reduces the cost of cotton production. In the early stages of development, however, the lowering of the grade of cotton, and consequently its value, has been a problem.

Use of a mechanical harvester is often accompanied by a great reduction, and sometimes complete elimination, of hand chopping and hoeing. This is accomplished through cross-cultivation, mechanical choppers, and flame cultivators. There are several types of mechanical choppers in use on either a commercial or an experimental basis which, combined with a successful harvester, greatly reduce the man-labor required in producing cotton. Furthermore, the use of successful machines for the two operations is usually accompanied by greater mechanization of other cotton production operations.

An indication of the possible reduction in harvesting costs through the use of mechanical harvesters was given in a report released by the Texas Agricultural Experiment Station and the United States Department of Agriculture in 1951, based on tests conducted in the high plains cotton area of Texas in 1949. These tests showed that usual hand harvesting charges would have to be reduced about 50 per cent in order to make them competitive with mechanical stripper costs when computed on the basis of an operation involving 150 acres of cotton. These estimates included allowances for differences in the quality and value of the cotton and differences in ginning costs. The stripper type of harvester, however, is not nearly so well adapted to many parts of the cotton belt as it is to the area in which these tests were conducted.

Another study, made by the University of California and the Department of Agriculture, gave the results of the use of 63 mechanical pickers by farmers in California in 1949. It showed that the average total harvesting cost plus the value of the cotton lost in the field (as compared with hand picking) and the loss in grade equaled \$26.17 per bale. This compared with hand-picking costs of \$45.00 per bale.

Studies made in the Mississippi Delta have not shown the mechanical picker to be nearly so much more economical than hand picking, due to operation for far fewer days, smaller numbers of bales harvested per machine, and greater field waste.

Ginning and Packaging.—In addition to separation of the fiber from the seed, cotton ginning

Table 1—DESCRIPTION OF UNITED STATES COTTON BALES

Kind of bale	Approximate dimensions (in inches)	Gross weight (approximate)		Ties per bale	
		Pounds per bale	Pounds per cubic foot	Usual number	Usual weight in pounds
Square, flat, gin, or uncompressed	56x28x45-48	500	12-14	6	
Standard or railway-compressed	56x30x22	500	22-30	8	
High-density	57x22x22	500	32-35	9	
Round	35 long; 22 in diameter	250	30-33	0	

includes cleaning and other preliminary processes involved in preparing seed cotton. Harvested cotton usually contains dirt, hulls, leaf fragments, and other materials which must be removed if the ginned lint is to have a high market value. Even with the most elaborate gin machinery, however, it is impossible to produce from roughly harvested seed cotton lint equal in quality to lint from carefully picked cotton. Moreover, many gins in the United States are still not equipped with improved cleaners and extractors. This factor, together with the differences in market value between low-grade and high-grade cotton, has retarded the use of mechanical harvesters.

Almost all the cotton produced in the United States is ginned on saw gins, the use of roller gins being confined to the small quantity of American Egyptian and Sea Island cotton produced. The modern gin used in the United States is highly efficient and is almost automatic, the whole operation involving a minimum of man-labor. From the time the cotton leaves the farmer's wagon or truck, from which it is sucked by air, until it is ginned and packaged in the form of a bale, it is scarcely touched by hands.

After the seed cotton has passed through the cleaning machines, it is fed through a lint flue into a condenser, which separates the lint from the air. The lint is usually delivered from the condenser by mechanical means into a press box where (in the case of the so-called square or flat bale) it is pressed down slightly by a mechanical trampler. The press box is located over the ram of the press, which rises from below and presses the cotton into bales. The bales are then covered with approximately six yards of bagging, which is usually made of jute, though sometimes of cotton, and are tied with metal bands called ties. The bagging used to cover the square or flat bale weighs 1.75 to 2 pounds per linear yard. After a bale has been sampled, one or two patches, weighing 3 or 4 pounds each, are frequently added. Tare (which includes bagging, patches, and ties) may under Southern mill rules total as much as 22 pounds per square bale and 24 pounds per compressed bale; under New England rules, as much as 24 pounds per 500-pound bale.

Over the years, about 98 per cent of each crop has been packaged in square bales and about 2 per cent in round bales. The square or flat bale is actually rectangular, measuring approximately 56 by 28 by 45 to 48 inches. In general, the gross weight of the square bales produced in the United States ranges from 480 to 530 pounds and averages somewhat more than 500 pounds. Additional compression of the square gin bales produces standard or railway-compressed bales and high-density bales. The dimensions, weight, and ties used for the various types of United States cotton bales are shown in Table 1.

The packaging of United States cotton has

never been wholly satisfactory. In fact, United States cotton has been characterized as one of the most unsatisfactorily packaged commodities entering the channels of world trade. Although the methods of preparing most other United States commodities for market have undergone continual improvement, cotton is still baled in about the same way as it was before the Civil War. The principal defects of the United States bale are (1) its ragged and unattractive appearance, (2) the inadequate protection afforded by the bagging materials, (3) the lack of even approximate uniformity in weight of bales and weight of tare, and (4) the excess weight of the covering materials (especially in the case of compressed bales containing one or two patches). This situation places United States cotton at a disadvantage in world markets (where it competes with the neater packages of other cotton-producing countries), increases marketing costs, and complicates trading practices.

Closely related to the packaging of cotton is the question of identification of individual bales. For many years methods of marking have been inadequate to preserve the identity of the bales after they have left the gins and until they reach the place of consumption. This factor sometimes contributes to careless or irregular practices on the part of growers, ginners, and others handling cotton, and thus handicaps the efficient functioning of the marketing system.

The Department of Agriculture has conducted experiments, sponsored demonstrations, and subsidized the use of improved bale coverings in an effort to improve the packaging of United States cotton. It is generally believed, however, that, under the existing system of gross-weight trading practices in the United States, important progress in the improvement of bale covers cannot be expected unless the government makes more desirable types of bagging available at below-market prices.

Cotton Varieties.—By 1936 more than 1,200 cotton varieties and strains had been listed by name as growing in the United States. Many of these so-called varieties, however, were merely synonyms or new names applied to the same stock by different growers. In the census report of 1880, 58 varieties were listed, but by 1925 only 25 of those listed in 1907 were in existence and only 9 were cultivated extensively. Despite the extent to which varieties, at least by name, come and go, there are a few lines which seem to be continuous. The history of the leading varieties of the early 1950's covers a considerable period—a period which would doubtless be much longer if earlier records had been kept.

In the early 1930's a committee of plant breeders and agronomists of the Association of Agricultural Workers (affiliated with the American Society of Agronomy) began the selection of certain typical varieties of the cotton belt for use

as standards in future breeding. The committee chose 31 typical varieties, many of which were represented by several strains. The list was published in the *Journal of the American Society of Agronomy*, January 1936, as follows:

Acala-5	Kasch
Acala-8	Half and Half
New Boykin	Lone Star
Cleveland-5	Mebane
Cleveland-884	Missdel
Piedmont Cleveland	Station Miller
Wannamaker Cleveland	Mexican Big Boll
Cook 307-6	Oklahoma Triumph-44
Delfos	Pima
Delta & Pine Land-8	Rowden
Delta & Pine Land-10	Arkansas Rowden-40
Deltatype Webber	Toole
Dixie Triumph	Stoneville
Dixie-14	Trice
Express-121	Wilds
Lightning Express	

No comparable list was prepared after World War II, but information on the most important varieties in use in 1952 indicated that at least one third of the 31 varieties had been discarded.

Since the early 1930's much has been done to encourage United States farmers to use improved and better-adapted varieties of cotton. The most important development of this nature has been the adoption and use of single varieties in numerous communities throughout the cotton belt. Active cooperation between the Department of Agriculture and affiliated state and other agencies to encourage the establishment of one-variety communities began in December 1930. By 1932 there were approximately 75 one-variety community units in operation from North Carolina to Texas, harvesting more than 2,000 acres of cotton that year. In addition, about 400,000 acres in the Southwest and an undetermined acreage in many other areas not specifically affiliated with the Department of Agriculture's program were devoted to the planting of one kind of cotton. In 1942 there were 2,563 one-variety communities, with a membership of 291,860 participating farmers and a planted area of 6,613,533 acres. While the participating farmers comprised a comparatively small percentage of the cotton producers of the United States, their acreage in cotton amounted to 28 per cent of the nation's total and represented a marked increase during the preceding decade. By 1950 the number of active one-variety community units had declined, largely as a result of consolidations, to 2,066, but the number of producers involved totaled 340,000 and the planted area had increased to 7,162,000 acres.

Because of larger yields per acre and a better average quality of cotton, the use of the improved varieties has materially increased the cash income received by the grower-members of the one-variety communities. The large areas standardized on superior varieties of upland cotton provide relatively large, even-running lots of cotton mostly of medium and long staple, and thereby contribute to more efficient marketing. When only one variety is produced in a given area, the mixing of seed at the gin, which generally occurs in areas where several varieties are grown, is avoided.

In 1944 a very large part of the acreage in one-variety communities was devoted to five variety types: Stoneville, Delta & Pine Land, Coker-100, Acala, and Mebane. While many other variety types were being grown either in one-variety communities or elsewhere in the cotton belt in 1952, larger acreages were probably

devoted to these types than to all others combined.

Insect Pests.—From the beginning of cotton culture on the North American continent, growers have had to contend with insect pests. In the mid-19th century and earlier, losses from insect pests were caused largely by the cotton worm, bollworm, and cotton aphid. These insects are still important, but they have been overshadowed by the boll weevil, cotton flea hopper, and pink bollworm. In most years the reductions in cotton yields per acre as a result of the boll weevil are considerably larger than those from all other cotton insect pests combined. The Bureau of Agricultural Economics estimated that during the period 1945-1949 the reduction from full yield due to the boll weevil was 10.7 per cent, as compared with an estimated reduction of 1.5 per cent due to all other insect pests.

Because of variations in climatic and other conditions, cotton insect problems differ materially from one area to another. In fact, at times the problems in two adjoining counties or on two adjoining farms may be strikingly different and require different measures of control.

All cotton pests can be controlled to some extent by cultural practices. Such factors as varieties, time of planting, spacing, methods of cultivation, crop rotation, and quantity and type of fertilizers used may each directly or indirectly affect the damage done by certain insect pests and their control. In addition, such natural factors as winter and summer temperatures, rainfall, and the number of clear days have important effects on the amount of damage done by insect pests. Furthermore, the numbers of most, if not all, cotton insects are reduced to some extent by predaceous and parasitic insects, spiders, and birds. An important means of controlling insect pests is a quarantine to limit their spread through shipments of cotton, cottonseed, or other vegetable matter. Quarantines have been effective in limiting the spread of the pink bollworm and the *Thurberia weevil*. Perhaps the principal man-made control measure, particularly from the standpoint of reducing losses in any individual year, however, is the use of insecticides. Recommendations concerning insecticides and other methods of controlling 10 important injurious cotton insects, together with other information on these insects, are summarized in Table 2.

Cotton Diseases.—Cotton is attacked by many fungus, bacterial, and physiological diseases, causing annual losses in the United States crop aggregating millions of dollars. The major diseases affecting cotton grown in the United States, in the approximate order of their importance, are root rot, fusarium wilt, bacterial blight, root knot, rust, anthracnose, and verticillium wilt.

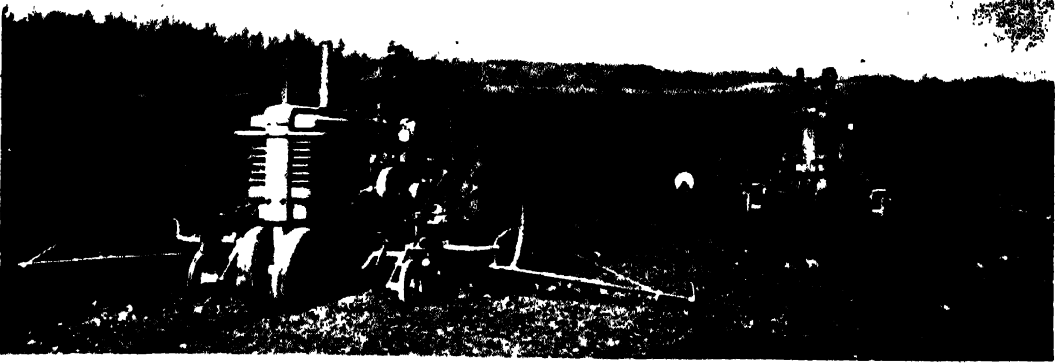
Root Rot.—Root rot, caused by the fungus *Phymatotrichum omnivorum*, is the most important cotton disease in the Southwestern states. The greatest damage occurs in Texas, especially in the heavy black-wax soils. By attacking and destroying the root system, the fungus causes sudden wilting and death of the plants. Its growth in the soil is entirely subterranean except when it is producing fruiting bodies. Since the fungus persists for many years in the soil and all varieties of commercial cotton seem to be equally susceptible to the disease, control measures are difficult. It has been demonstrated, however, that damage from the disease can be greatly reduced by crop rotations, good tillage practices, and the maintenance of a high state of fertility.

Table 2—CONDENSED INFORMATION ON 10 IMPORTANT COTTON INSECTS IN THE UNITED STATES

Common name of insect	Scientific name of insect	Probable native home	Distribution in United States	Nature of injury	Crops other than cotton attacked	Control measures recommended to the late 1940's ¹
Boll weevil	<i>Anthonomus grandis</i> Boheman	Mexico and Central America	Texas, Oklahoma, and all cotton states east of them	Causes shedding by feeding on squares and bolls. Grubs feed on seed and lint in green bolls.	None	Dust at 5-day intervals with calcium arsenate, when from 10 to 25 per cent of the squares are punctured, using 5 to 7 pounds per acre. Destroy stalks early in fall. Practice good culture.
Bollworm	<i>Heliothis erinigera</i> Hübner	Tropical and subtropical America	General	Destroys squares and bolls by eating into them.	Corn, tomatoes, beans, etc.	Dust with cryolite, lead arsenate, or calcium arsenate at the rate of 8 to 10 pounds per acre. Plow in fall and winter to destroy pupae in soil.
Cotton worm	<i>Alabama argyria</i> Lecles Hübner	Mexico, Central America, and South America	May appear at irregular intervals, anywhere in cotton belt through migration of the moths from countries south of the United States.	Defoliates plants.	None	Dust or spray with calcium arsenate or other arsenical poison.
Cotton flea hopper	<i>Psalidium teridius</i> Reuter	United States	General	Makes feeding punctures that cause small squares to shed.	None	Destroy goatweed, horsemint, and other weeds in winter. Dust with 12 to 18 pounds of finely ground dusting sulphur, or with 12 to 15 pounds of a mixture of 2 parts of sulphur and 1 part of calcium arsenate, per acre. If boll weevils are present, use the mixture of sulphur and calcium arsenate.
Tarnished plant bug	<i>Lygus pratensis</i> Linnaeus	Europe	General	Makes feeding punctures that cause squares to shed.	Many	Dust at the rate of 12 to 15 pounds per acre with a mixture of 2 parts of sulphur and 1 part of calcium arsenate, or a mixture of 12 parts of sulphur to 1 part of paris green.
Rapid plant bug	<i>Adelphocoris rapidae</i> Say	United States	General	Makes feeding punctures that cause squares and small bolls to shed.	Many	Same as for tarnished plant bug.
Common red spider	<i>Tetranychus telarius</i> Linnaeus	Unknown	General	Sucks plant juices, causes shedding of leaves.	Many	Keep down weeds near cotton fields. Dust with finely ground sulphur, 10 pounds per acre.
Cotton aphid	<i>Aphis gossypii</i> Clover	Northern Hemisphere	General	Sucks plant juices, stunts plants, causes leaves to curl and fall. Gives off honeydew that injures fiber in open bolls.	Melons, squash, cucumbers, okra, etc.	Dust with 2.5 per cent of nicotine prepared by mixing 6¼ pounds (5 pints) of nicotine sulphate with 100 pounds of hydrated lime or with calcium arsenate if boll weevils are also to be controlled.
Pink bollworm	<i>Pectinophora gossypiella</i> Saunders	India	Limited areas in Arizona, New Mexico, Texas, Florida, and Oklahoma	Reduces quality and quantity of seed and lint by feeding of worm.	None	Quarantines protect uninfested areas. Sterilize seed by heating. Destroy gin trash. Pick cotton early and destroy stalks. Pasture fields after picking. Plow deeply and irrigate if practicable.
Cotton leaf perforator	<i>Bucculatrix thurberella</i> Busck	Mexico or southwestern United States	Abundant only on southern borders of California and Arizona	Skeletonizes leaves.	None	Dust with powdered lead arsenate, 5 to 7 pounds per acre. Destroy old plants. Plant cotton annually on well-prepared land.

¹ Since the late 1940's, there have been so many effective insecticides under investigation that federal, state, and private entomologists have met each year and prepared revised recommendations for the control of cotton insects during the coming year. These recommendations may be obtained from the United States Department of Agriculture.

COTTON



Courtesy National Cotton Council of America

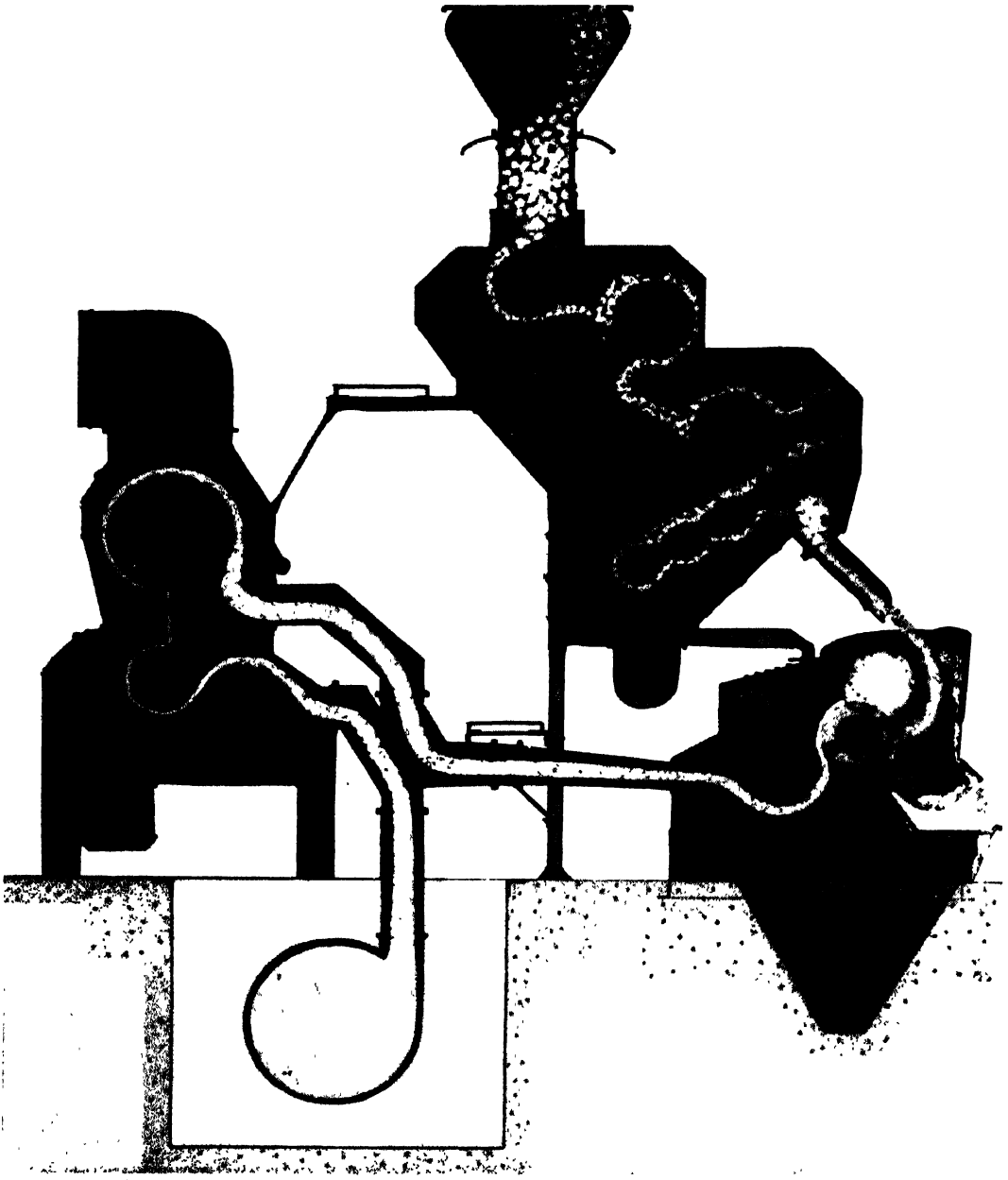
Top. Seedbed preparation on modern mechanized cotton farm, using tractor-powered lister. Left: Two-row tractor cultivator in operation. Right: Spindle-type picker extracts cotton leaving unopened bolls for later harvest



Courtesy United States Department of Agriculture

Close-up showing unopened cotton bolls, and fluffy fiber of the mature bolls.

COTTON



Courtesy Continental Gin Company

Above: Sectional view showing flow of cotton through extractor-feeder, brush gin, and lint cleaner combination.



Left: An old cotton gin, made 50 years after Eli Whitney invented the first saw gin. The modern gin is but an improved version of Whitney's invention.

These measures are more effective when properly combined. The more effective rotations include grain crops and winter or summer legumes, and regularly involve fall plowing. Nitrogen, supplied by barnyard manure or by turning under legumes, is especially beneficial, although heavy applications of inorganic nitrogen are usually helpful.

Fusarium Wilt.—This disease, caused by the fungus *Fusarium vasinfectum*, is found in many types of soil from Virginia to New Mexico. Wilt-infected plants appear dwarfed fairly early in the season, the leaves become yellow between the veins, and sections of the stems and roots are black, giving rise to the common name "black rot." The fungus enters the roots of the plant from the soil, and its growth produces in the tissues toxins which finally accumulate in sufficient quantity to cause wilting and, eventually, death of the plant. In combating fusarium wilt, growers should use wilt-resistant varieties of cotton in combination with crop rotation, fertilize the plants liberally with high-grade balanced fertilizers, and maintain adequate vegetable matter in the soil by adding manure or by plowing under cover crops.

Bacterial Blight.—Also known as black arm and angular leaf spot, this blight is caused by the organism *Xanthomonas malvacearum* and occurs generally throughout the South and also in the Southwestern cotton districts. The principal injurious effects are stunting or death of seedlings, defoliation of plants, shedding of buds, and rotting of bolls. Damage is often especially severe after windstorms and during cold, wet weather, for the disease is spread chiefly by wind-blown rain. Experiments have shown that the disease is largely seedborne and may be controlled effectively by seed treatment. The use of resistant varieties is also recommended.

Root Knot.—This disease is caused by minute eelworms or nematodes (*Heterodera marioni*) which bore into the roots and produce galls or abnormal swellings. It affects cotton and many other plants in almost every state in the cotton belt but, like wilt, is most severe in sandy soils of low water-holding capacity. Root knot causes swellings, nodules, and discoloration of the roots and stunts the growth of the plants by cutting off the supply of food and water. It is disseminated by drainage water, cultivating implements, infected plant roots, or any agent carrying soil particles. In cotton districts where the disease is unusually prevalent, rotation with such non-susceptible crops as winter grains or resistant summer legumes for two or three years in succession is the only effective control measure so far developed. On heavily infested soil the planting of very susceptible varieties of cotton should be avoided.

Rust.—"Potash hunger" or rust is a physiological disorder of the cotton plant prevalent in soils of low fertility, especially those deficient in vegetable matter and available potash. Plants affected by rust fail to attain normal growth and lack a healthy green color. Later the entire leaf becomes somewhat blackened, curled, and ragged and then sheds, leaving the stalk bare. Since most of the leaves are shed prematurely, the bolls do not develop properly and the lint is of inferior quality. Rust may be satisfactorily controlled by liberal applications of potash or potash-containing fertilizers, preferably in conjunction with the growing and plowing under of

green-manure crops, or by adding barnyard manure.

Anthraxnose.—This disease, caused by the fungus *Glomerella gossypii*, does much damage to cotton in the Southeastern states. Where cotton grows rank, boll rot, often called pink boll rot, may become common. The greatest loss from anthracnose, however, occurs in the seedling stage, when the disease is spoken of as "damping off" or "seedling blight." The loss of stands, often necessitating replanting, is likely to occur in cold, wet springs. Since the disease is disseminated largely through infected seed, it may be controlled by using seed with a minimum of infection and by treating the seed with fungicidal dusts.

Verticillium Wilt.—The symptoms of plants infected with this disease, caused by the fungus *Verticillium albo-atrum*, and of those infected with fusarium wilt are very similar. Verticillium wilt occurs commonly in the neutral to alkaline soils from Mississippi to California, whereas fusarium wilt predominates in the more acid soils of the Southeast. Commercial varieties differ greatly in their susceptibility to verticillium wilt, and very susceptible varieties should not be planted in heavily infested soils.

OTHER COTTON-PRODUCING COUNTRIES

Cultural Practices and Harvesting.—Because of wide variations in soil and climate, background of producers, ability of producers to obtain improved farm machinery, and income and general economic status of growers, cotton cultural practices outside the United States differ to an even greater extent than those within the United States. In parts of China, India, Pakistan, Egypt, the Anglo-Egyptian Sudan, Nigeria, Uganda, Kenya, Tanganyika, the Belgian Congo, Angola, Northern Rhodesia, Southern Rhodesia, Mozambique, Brazil, Peru, and some other cotton-producing countries and territories, cotton is cultivated with very primitive implements. In China, as in some parts of other countries, the seed is sown broadcast and is given very little cultivation, with the result that the plants grow up thickly, develop poorly, and yield only small quantities of poor-quality cotton. In certain districts of Brazil, Argentina, Peru, Mexico, the Soviet Union, Egypt, India, and Pakistan, and to a more limited extent in other countries, cultural practices and farm implements used compare favorably with those employed by some cotton producers in the United States.

In several countries mechanical harvesters have been used at least on an experimental scale, but a very large part of the cotton is hand picked. With few exceptions, hand snapping, sledging, and mechanical picking have not been employed even to the limited extent that these methods have been used in the United States.

Ginning and Packaging.—In India and Pakistan a small amount of cotton is still ginned on the charkha, a primitive machine which is worked by hand and has an output of about five pounds of lint per day, but the bulk of the ginning is done on modern power-driven roller gins. Saw gins are used to some extent in the Punjab and other areas where American upland cotton is grown. In parts of China ginning is also done with primitive machines, although there are few, if any, countries which do not have at least some modern power-driven gins. Cotton of Egyptian and Sea Island types (*G. barbadense*)—as well

as American Egyptian cotton in the United States—is ginned largely on power-operated roller gins. Such gins give much better results with these types of cotton than do the saw gins used most commonly throughout the world on upland cottons (*G. hirsutum*). A large part of the cotton produced in Brazil, Argentina, Mexico, and other countries is ginned on saw gins similar to those used in the United States, where, in fact, many of the gins in these countries were manufactured.

In Egypt the baling system is entirely different from that in most other countries, bales from interior ginneries being remade at the compresses in Alexandria. The Egyptian bale weighs about 750 pounds net. It has a density of about 35 pounds per cubic foot and a tare equivalent to about 2 per cent of the total weight. In India and Pakistan bales usually weigh about 400 pounds, although some designed for export weigh 500 pounds, and the density is about the same as that of Egyptian bales. In most British colonies bales weigh about 400 pounds, but in some of the colonies and in other areas producing small quantities cotton is sometimes packaged in bales weighing only 200 to 300 pounds.

Cotton Varieties.—Improvements in cotton varieties in the modern sense may not be much older in other cotton-producing countries than they are in the United States. Many centuries ago, however, some crude form of seed sorting or selecting may have accelerated the adoption of wild forms of cotton to domestication in areas where the cotton plant was native.

India and Pakistan.—In the Indian subcontinent, which is perhaps the oldest cotton-growing area in the world, the native cotton, so far as is known, has always been very short in staple and much of the work in breeding and improvement has been concentrated on the development of better staple. Most of this work, which also includes efforts to obtain higher ginning output, better yields, and greater disease resistance, has been done in states and provinces where short-staple cottons are chiefly grown. Considerable progress in improving cotton varieties has been made through various crosses and the introduction of American upland stock.

Read P. Dunn, Jr., in *Cotton in Pakistan and the Indian Union* (see *Bibliography*), reported on the proportions of the various cotton varieties in the 1947-1948 crop, as shown in Table 3. From this it is seen that American upland varieties then accounted for about 9 per cent of the cotton crop of India and Pakistan; *Arboreum* types, which are indigenous to India, for nearly 57 per cent; and the *Herbaceum* group, originally introduced from Africa, for 34 per cent.

China.—In China, which long ranked as the second largest producing country, much improvement was made before World War II in the varieties grown. In 1915 the University of Nanking began experiments in cotton growing and demonstrated the practicability of growing American upland cotton in several parts of the country. Several standard sets of cotton seed, representing widely different types of American upland varieties, were obtained from the United States Department of Agriculture in 1919, and tests were conducted in 26 centers, mostly mission stations. About this time it was reported that Acala and Trice were two American upland varieties which were quite well adapted to certain areas, while in other areas native varieties are said to have given better results. From then

Table 3—COTTON VARIETIES IN INDIA AND PAKISTAN

Botanical class and variety	Estimated percentage of 1947-1948 crop
Bengals, comillas	7.3
Oomras	12.1
Malvi, Garoni, Mathia	8.5
Karunganni, Northern, Cocanada, Uppam, Tinnevely, Mungari	5.2
Jarila, Verum	23.6
Total, <i>Arboreum</i> (Asiatic)	56.7
Dholleras, Wagad	9.8
Broach, Vijay	11.3
Surti	4.9
Jayawant	2.6
Western Farm	5.6
Total, <i>Herbaceum</i> (Asiatic)	34.2
Buri	2.1
Cambodia	4.5
Gadaq 1	1.1
LSS, 4F	1.3
Perso-American, Mall, etc.	.1
Total, <i>Hirsutum</i> (American upland)	9.1

until the Japanese invaded China in 1937, the percentage of American upland varieties increased greatly. Relatively little is known about the cotton situation in China during and since World War II.

Egypt.—Since 1905, when Egyptian growers began using modern plant-breeding methods, several important varieties of cotton have been developed and produced exclusively in Egypt. In its official reports and estimates, the Egyptian Ministry of Agriculture groups the various varieties into three categories: long staple, which is approximately $1\frac{1}{8}$ inches and longer; medium staple, $\frac{1}{4}$ to $1\frac{1}{32}$ inches; and short staple, about $1\frac{1}{8}$ to $1\frac{1}{32}$ inches. These terms differ from similar terms used in the United States, since the Egyptian varieties referred to as short staple produce staples, many of which are $1\frac{1}{8}$ inches and longer, which are generally called long staples in the United States. As of 1950-1951, the principal varieties of Egyptian cotton were as follows:

Long staple	Medium staple	Short staple
Karnak	Giza-30	Ashmūni
Menoufi (Minūfi)	Giza-23	Zagora

Soviet Union.—In the last quarter of the 19th century, Russian cotton growers began to replace short Old World cottons with American upland varieties. After the revolution of 1917, new varieties developed by Russian plant breeders were introduced on a commercial scale and soon became widely used. Cotton breeding and improvement received considerable impetus in the 1930's. About 1935 the variety called Navrotsky, developed by E. L. Navrotsky from the American upland variety of Russell, was estimated to account for about 75 per cent of Soviet cotton production. Strains of King, Mebane Triumph, and others had also been adapted and were in use by that date. Relatively small acreages of cotton were planted to varieties of Egyptian origin. Little authentic information has been available about cotton varieties in the Soviet Union since 1939.

Brazil.—The Russell variety of Truitt origin, which was developed in the United States in 1895, was apparently introduced into Brazil shortly thereafter, and it became the basic stock for much of the upland cotton of southern Brazil. Other upland varieties imported by Brazil include

Sunbeam, Upright, Express Cleveland, Durango, and Webber. In northeastern Brazil these varieties became hybridized and mixed among themselves, and some were crossed with native tree cottons. Since the early 1930's the Brazilian federal government and the various state governments have been active in the improvement of Brazilian cotton, and government control of seed distribution has been instituted. As a result, a very large percentage of the cotton grown in Brazil is of American upland origin.

Peru.—The cotton industry in Peru was made possible largely by introducing and breeding new varieties. The most important contribution to plant breeding by the Peruvian cotton industry was the development in 1918 of Tanguis, a wilt-resistant variety, from possible hybrids with previously imported stocks. Pima cotton, developed for the irrigated valleys of Arizona and California, was found to be adaptable to Peru as well. Of the 1942 Peruvian crop, it was estimated that 82 per cent consisted of Tanguis, with Pima ranking second. Peruvian Full-Rough, Peruvian Semi-Rough, American upland, and Egyptian each made up 1 per cent or less of the crop. In 1950, Tanguis and Pima still accounted for nearly all the Peruvian crop.

Argentina.—The cotton crop of Presidente Perón Province (formerly Chaco Territory), which in many years has accounted for 90 per cent or more of the total Argentine crop, consists of American upland varieties. Several of the leading varieties of United States cotton have been introduced and distributed to growers under government control. As a result of the work of local plant breeders under the National Cotton Board, both staple and yield have shown improvement. Because of its high quality and staple length, cotton grown in the Province of Santiago del Estero is used extensively by Argentine tire manufacturers. All or almost all of the Argentine crop is presumably of the upland type.

Mexico.—There is little information about cotton breeding in Mexico. Doubtless whatever improvement has been made is due largely to the selection of native varieties and the importation of improved varieties from the United States. Mexican commercial cottons are of the upland type. On the whole, the average staple length is apparently better than the average of the United States crop.

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(M.R.C.)

4. MARKETING AND PRICES. In the United States the marketing of cotton generally begins after it has been ginned and baled. After the baled cotton has left the gin, it is sold by the producer, generally in a local market, to one of several types of buyers who may be located there. In most instances, this sale is only the first of many transactions involved in moving the cotton from the producer to the manufacturer. In areas adjacent to mills, the producer may sell his cotton directly to the mill buyer, but the great bulk of the United States crop passes through a succession of markets, which fall into four general types: (1) local, country, or primary markets; (2) central or concentration markets; (3) mill or spinners' markets; and (4) export markets.

A single market locality may have more than one marketing function and thus belong in two or more of these categories. Thus Houston, Texas, is important both as a central market and as an export market, and it may also serve as a local market for cotton grown nearby. A market like Gastonia, N. C., performs the functions of a local market, a central market, and a mill market.

The greater part of the United States cotton crop moves from the local market either to a compress or concentration point or to the ports, where it is compressed to standard or high density for shipment to United States mills, other central markets, or export markets. The cotton warehouse and the compress provide the owner with storage, which, with insurance, protects the cotton from weather, fire, and theft. The primary function of the compress, however, is to press the bale into a smaller, more compact package and thus make it possible to place a greater number of bales in a given space, such as a railway car, ship, or warehouse. Because of this saving in space, freight and storage rates are lower for a compressed bale than for an uncompressed bale, and if the cotton is to move very far it is generally compressed.

The flow of cotton from farm to mill involves a number of services connected with concentration, merchandising, and distribution. Estimates made in 1944 placed the spread between prices received by growers and those paid by manufacturers for cotton delivered to the mill at approximately \$10 per bale. The spread between the average price of Middling $1\frac{1}{16}$ -inch cotton in seven Texas and Oklahoma markets and the price landed at 201 mill points for the 1950-1951 marketing season was \$11.95 per bale. This spread, which represents that for the cotton belt as a whole and covers costs and profits connected with the various services, varies greatly in different producing areas and in different years. In those areas where the cotton is sold by the grower directly to the mills and where much larger quantities pass through the hands of a single buyer, the marketing spread is relatively low. In areas farthest from mill centers, and when specialty cottons are involved, the marketing spread is much larger than the average figure. In years when prices are high, the spread is much greater than when prices are low.

In addition to storage and compression, services involved in moving cotton from the farmer to the manufacturer include receiving and related services (issuance of warehouse receipts, sampling, weighing, marking or tagging, storage up to 30 days, and the like), insurance, transportation, financing, classing and assembly, risk bearing, overhead, and profits for those performing

these services. Of these, storage and insurance, financing, transportation, classing and assembling, and overhead are by far the most important and are estimated to account for 80 per cent or more of the total spread.

The owner or depositor of each bale of cotton placed in storage receives a negotiable warehouse receipt, identifying the individual bale and giving its weight. This receipt is readily accepted in marketing channels, and by its negotiation the ownership of the cotton passes from one buyer and seller to another. The importance of maintaining the identity of the individual bale is due to the variation in bale weights and, what is perhaps even more important, to the wide variation in the quality of cotton. One of the important services performed by cotton merchants in channeling cotton from the farmer to the manufacturer deals with quality.

Commercial Quality Classification.—As shown in the section on *The Cotton Plant*, the different species of cotton normally produce fibers varying greatly in staple length, which is one of the main factors determining the quality of cotton. Furthermore, because of differences in varieties, soils, rainfall, temperature, tillage methods, and harvesting and ginning practices, the quality of cotton of a given species may vary greatly. In fact, there are often considerable variations on a single farm where only one variety is grown. Cotton quality is important because it has a major bearing on the type and quality of the goods produced. In the main, the longer the staple length, the stronger is the yarn of a given size. Likewise, the higher the grade, the higher is the quality of the yarn and fabric and the smaller is the spinning waste. For these reasons, the prices paid for different types and qualities of cotton vary widely.

In general, cotton quality may be defined as the physical properties, characteristics, or attributes of cotton which affect its usefulness. The principal physical elements influencing the quality of cotton, thus defined, include (1) length, uniformity, fineness, strength, and maturity of the fibers; (2) color, leaf, and other foreign matter; and (3) ginning preparation of the cotton. Commercial quality classification or classing of cotton has been defined as the art and operation of systematically recognizing and identifying similarity in quality according to accepted scales of measurement by the use of consistent terms of description and by a consistent method. Although mechanical devices are available for determining many of the elements of cotton quality, they are not in general commercial use in buying and selling cotton, particularly in local markets. Thus far commercial classification of cotton has been made very largely by sight and touch.

In the marketing and distribution of United States cotton, quality is usually divided into three categories: grade, staple length, and character. Under authority contained in the Cotton Futures Act (1916) and the Cotton Standards Act (1923), official government standards have been established for the first two categories.

Grade.—Elements determining the grade of cotton include (1) color, (2) amount of foreign matter, and (3) ginning preparation. Color is influenced by the weathering or exposure to which the open cotton has been subjected, and by damage from insects and fungi both before and after the boll is opened. The color of the cotton has an important bearing on dyeing prop-

erties and, in turn, on the color and uniformity of the finished product.

Foreign matter includes dried and broken plant foliage of various kinds, seed coat fragments, motes, sand, and dust. The amount of such matter is determined largely by harvesting and weather conditions. These elements affect the appearance of the finished yarn and fabrics and the cost of processing the fiber.

Preparation is the term used to describe the degree of smoothness with which the lint has been ginned and the relative neppiness or neppiness of the ginned lint. In general, smoothly prepared cotton contains less waste and produces a smoother and more uniform yarn than roughly prepared cotton. Moreover, where preparation is poor as a result of neppiness, the finished yarn and fabrics may contain small visible dots or specks which have not been removed in the manufacturing process.

The official grade standards for American (United States-grown) cotton embrace 33 grades for upland, 5 full grades and 4 half grades for American Egyptian, and 6 full grades and 5 half grades for Sea Island. Most of the grades for upland cotton were promulgated by the secretary of agriculture on Aug. 29, 1935, effective on Aug. 20, 1936. Since these standards have been adopted by many of the leading cotton associations and exchanges of other countries, they are referred to as Universal Standards for American-Upland Cotton. These 33 grades of upland cotton are divided into 6 major color combinations: Extra White, White, Spotted, Tinged, Yellow Stained, and Gray. Within each color combination there are 3 to 9 different grades. The 9 White grades represent a very large part of the American upland crop. The terms Middling Fair, Strict Good Middling, Good Middling, Strict Middling, Middling, Strict Low Middling, Low Middling, Strict Good Ordinary, and Good Ordinary provide a scale from high to low for variation in color attributes within any major group, for variation in foreign matter, and for variation in ginning preparation.

Staple Length.—The staple length of cotton has been defined officially as "... the normal length by measurement, without regard to quality or value, of a typical portion of its fibers under a relative humidity of the atmosphere of 65 per cent and a temperature of 70 degrees Fahrenheit." As practiced by the cotton trade, commercial classification of staple length of United States cotton is determined by a process known as pulling the staple. This consists of repeated operations whereby small samples of cotton are drawn out and arrayed by the cotton classer, skillfully using the thumb and forefinger of each hand. By these procedures well-trained classers can determine the approximate staple length of the bulk of the fibers with a considerable degree of accuracy, when compared with either the pull of other classers or the length of staple as determined by mechanical means.

An order of the secretary of agriculture of Oct. 25, 1918, promulgated the standards for staple. As amended, this order provides for the designation of various lengths in terms of inches and fractions of an inch from less than $\frac{3}{4}$ inch upward, in gradations generally of $\frac{1}{32}$ inch to $1\frac{1}{4}$ inches, disregarding any fraction less than $\frac{1}{32}$. The order authorizes the issuance of practical forms of standards for some 20 individual lengths of upland cotton. Staple types for vari-

ous lengths of American Egyptian and Sea Island cottons are also available. In view of the absence of official standards for character, specialists in cotton standardization carefully select the bales to be used in preparing staple types so that they may be considered representative of cotton with normal character. When these staple types are properly pulled under standard conditions, the classer's pull will represent the length indicated on the standards package.

Character.—Character may be defined as those elements of cotton quality which are not part of grade or staple length. There are no character standards, although a number of the factors recognized as part of character are susceptible of measurement. Some of the more important of these elements are (1) strength, uniformity, fineness, and wall thickness of the fiber; (2) elasticity, pliability, and frictional properties; (3) fiber porosity; and (4) fiber durability. While measurements of several of these elements may be made, for the most part such measurements cannot be made sufficiently rapidly to be used generally in buying and selling transactions. Through experience, however, classers become familiar with certain cotton characteristics which will or will not give the desired spinning results.

Despite the development of a high degree of skill among classers, the classing of cotton for character is at best inexact. It is generally agreed that the manufacturing results obtained from cotton often do not confirm the classer's impression of the character of a given bale of cotton. Consequently, as improved laboratory techniques have become available, the use of such measurements in helping to determine the cottons best suited for manufacturing various types of yarns and fabrics has become quite extensive.

Spot Markets and Marketing Practices.—

Local Markets.—A local, primary, or country market is one in which the farmer sells his cotton. Most such markets have cotton gins, and sometimes there is little more than a gin at the market. In a local market the farmer usually sells to one of several types of buyers: (1) ginners; (2) local independent cotton merchants, including individuals or firms engaged primarily in other businesses; (3) representatives of farmer cooperative associations; (4) traveling or resident representatives of large cotton merchants whose headquarters are located in other markets; (5) traveling or resident buyers for cotton mills; and (6) commission men or factors. The number of buyers in a single market varies from 1 to 20 or more.

These markets represent the first step in the movement of cotton from the grower to the ultimate consumer. They are found in almost every village and town and in many cities of the cotton-producing area of the United States. The annual volume of cotton sold in a single market varies from a few hundred bales at country gins and at crossroads stores to many thousand bales in larger towns and cities.

In local markets cotton is sold by the farmer to buyers who may or may not be qualified to determine quality. This is true despite the fact that differences in the quality received in a given market on a given day may be sufficient to account for variations in the value of the cotton, as quoted in central markets, ranging up to several cents a pound. Most farmers know very little about the exact quality of their cotton. The general level of knowledge has increased,

however, and the system of buying commonly referred to as "hog round," where there is little or no variation in price because of differences in quality, has declined. This system is considered to be a handicap to the efforts of government agencies to improve the quality of cotton being grown. Very often varieties producing a lower quality give higher yields per acre than those producing a higher quality, and returns received from this cotton may therefore equal or exceed those from cotton of better quality. Studies made by the Department of Agriculture indicate, however, that even in markets of this type average prices received by all growers are generally influenced by the average quality of the cotton sold in the particular market.

The Department of Agriculture attempts not only to determine the marketing practices existing in the various local markets throughout the cotton belt and the effect of these practices on prices and quality improvement, but also to encourage the sale of cotton on the basis of each individual bale's grade and staple. For many years the department has provided various market news services designed to give growers more information on central market prices for various qualities of cotton. Since 1938 free government classification of cotton has been furnished for an increasing proportion of the cotton crop so that growers may know the quality of their cotton. This service, together with information on central market quotations, offers growers a means of determining whether or not local buyers are paying a fair value for the cotton being sold.

Most local markets have a public square, a cotton yard, a warehouse, or a railroad platform where the cotton is received, weighed, and sampled, and where receipts are issued. In some markets sales may be based on inspection of the cotton while it is in the yard or on a railroad platform; in others sales may be based on samples, receipts being obtained at the yard or warehouse. Markets of this type furnish a ready and convenient place where growers may sell at almost any time. They also provide a point for assembling sufficient quantities to facilitate handling.

United States farmers usually sell their cotton soon after it has been ginned. In limited areas, particularly in sections of the northern part of the cotton belt, a proportion of the crop is sold as seed cotton. On the average, 90 to 95 per cent of the United States crop is ginned during the first four months of the season. Sample studies indicate that about seven tenths of it is sold by growers during this four-month period, and that in 1936-1937 a little more than half the cotton was sold on the same day that it was ginned, more than seven tenths within 2 days, and about seven eighths within 10 days after it had been ginned. In general, the situation probably has not changed materially since these studies were made, except in years when prices are about the same as, or below, government loan rates. Then substantial proportions of the crop may go under government loan and smaller proportions are sold as soon as the cotton has been ginned.

Since a large part of the crop is grown by farmers who produce only a few bales and take only one or two bales to the gin at a time, most sales are made in small lots. The sale is usually for cash, and delivery is made immediately. Soon after the cotton has been purchased, the local buyers usually resell it to shippers for

immediate delivery. As a general rule, farmers and small buyers do not hedge their cotton, but sell promptly and so transfer to larger dealers the risks from price changes. To a very limited extent, however, farmers in some parts of the cotton belt sell at least part of their cotton for forward delivery at a price to be fixed at a later date.

Central and Export Markets.—Central or concentration markets are those in cities and larger towns where cotton from the local markets is concentrated for distribution to consuming centers either in the United States or in other countries. Central markets which are important in the export business may also be classed as export markets. Among the personnel of central and export markets are general cotton merchants, spot brokers, factors, growers' cooperative associations, and mill buyers. Cotton merchants include those who buy mainly in local markets and sell either to domestic spinners or to foreign importers or spinners. Spot brokers sell cotton on commission, chiefly for dealers in interior markets but to some extent also for local holders in central markets, based mainly on samples displayed on tables in salesrooms. Some brokers also buy on commission for foreign importers and spinners. The factor receives cotton on consignment from the owner (to whom he may or may not have advanced funds) and sells it in accordance with the owner's instructions. Growers' cooperative associations merchandise cotton for growers in a way similar to that followed by merchants who buy in the interior.

Facilities in central markets generally include a cotton exchange, which is the center of activity in the market, as well as offices and sample rooms, compresses, warehouses, and freight terminals. At ports there are also steamship docks. The exchanges enforce rules to ensure fair practices in trading and compile statistics on receipts, stocks, shipments, and prices. In addition, there are banks which supply funds for financing the buying and holding of cotton.

These markets are located at interior points and ports favorably situated for assembling and distributing cotton. Those in the interior include such markets as Dallas, Little Rock, Memphis, Montgomery, and Atlanta, and those at ports include Houston, New Orleans, Mobile, and Savannah. A large part of the United States crop is usually concentrated in and distributed from central markets, although considerable cotton moves directly from local markets and smaller interior concentration points to domestic mills.

Mill or Spinners' Markets.—These markets are places where cotton is purchased by and sold to buyers representing cotton spinners. They are generally located near mill centers, but also include all central markets. Some of the important mill markets in New England include Boston, New Bedford, Fall River, and Providence. In North Carolina such markets include Greensboro, Gastonia, and Charlotte; in South Carolina, Spartanburg and Greenville; in Georgia, Atlanta and Augusta; in Alabama, Huntsville.

Important spinners' markets for United States cotton in other countries before World War II included Liverpool and Manchester, England; Rouen, Lille, Spinal, and Mulhouse, France; Ghent, Belgium; Chemnitz, Munich, and Rhine, Germany; Oporto, Portugal; Rotterdam, Netherlands; Milan, Italy; Barcelona, Spain; Osaka, Japan; and Shanghai, China. Some of these

markets, such as Liverpool, Barcelona, and Osaka, were import markets as well as mill markets. In addition, Le Havre, France, and Bremen, Germany, were important importing and distributing centers for United States cotton. Since World War II government agencies have controlled much of the importation and distribution of cotton in most of these countries, thus reducing the importance of these markets.

Spinners' markets carry out the important function of making readily available to mills the quantities and qualities of cotton needed by manufacturers. In general, cotton is offered to spinners in lots of 100 or more bales, even running in grade and staple length. The quality may be indicated by description in terms of government standards, by samples submitted or displayed, or by private type.

Among the personnel of United States spinners' markets are mill buyers and their representatives, cotton shippers, merchants, brokers, representatives of growers' cooperative associations, and possibly other dealers. Mills located in the cotton-growing states often buy directly from growers or from ginners and other local buyers. In some seasons mills in these states are reported to obtain about 25 per cent of their requirements of raw cotton in this manner, nearly twice this proportion from shippers and their brokers, and the remainder from cotton merchants and growers' cooperatives. Mills outside the cotton-growing states are reported to obtain the largest proportion of their raw cotton requirements from shippers and their brokers, the next largest proportions from cotton merchants and from growers' cooperative associations or their brokers, and none from growers or ginners.

The raw cotton needed by mills for the manufacture of cloth and yarns already sold at fixed prices is usually purchased at fixed prices, but most of that required is generally purchased on call. When purchases are made on call, the basic price is usually fixed at a specified number of points on or off the price of a designated futures contract, the buyer usually being given the option of deciding when the price shall be fixed. Prices of raw cotton are usually set when the prices of the manufactured products are fixed. By purchasing in this manner, mills obtain at least partial protection against losses from changes in price.

Cooperative Marketing.—Attempts of United States cotton farmers to improve their economic condition through cooperative marketing date back to the early 1870's. Thereafter many cotton associations were organized. Several covered the entire cotton-growing South; others were local in character and limited in influence. The early organizations encountered many difficulties, either because their objectives were unattainable or because their plans and operating procedures were poorly conceived and executed. Whether they were successful or unsuccessful, however, they all contributed something to the background of experience which led to the modern system of cooperative marketing of farmers' cotton.

The emphasis of cotton cooperative associations is laid primarily on marketing members' cotton in the most efficient way, obtaining for members the highest possible price based on quality, and rendering improved marketing services at a minimum cost. Such marketing services include classing, assembling, transportation, ware-

Table 1—STATE AND REGIONAL COOPERATIVE COTTON MARKETING ASSOCIATIONS, 1951

Association	Headquarters	Year of incorporation
Oklahoma Cotton Growers Association	Oklahoma City, Okla.	1921
Staple Cotton Cooperative Association	Greenwood, Miss.	1921
North Carolina Cotton Growers Cooperative Association	Raleigh, N. C.	1922
Southwestern Irrigated Cotton Growers Association	El Paso, Texas	1926
California Cotton Cooperative Association, Ltd.	Bakersfield, Calif.	1927
Mississippi Federated Cooperatives (A.A.L.)	Jackson, Miss.	1929
Mid-South Cotton Growers Association	Memphis, Tenn.	1930
South Texas Cotton Cooperative Association	Corpus Christi, Texas	1932
Cotton Producers Association	Atlanta, Ga.	1933
Texas Cotton Growers Association	Dallas, Texas	1935

housing, financing, insurance, hedging, selling, and shipping. Savings effected in performing these services are returned to growers in the form of patronage dividends based on the number of bales delivered. Associations also take an active part in programs for improving cotton quality and marketing conditions and facilities.

As of 1951, there were 10 large-scale state and regional cooperative marketing associations operating in the United States. Their names, addresses, and dates of incorporation are shown in Table 1. The total quantity of cotton handled by these and other large-scale cooperative cotton marketing associations in the years 1921-1922 to 1949-1950, together with the proportion which this cotton represented of total United States ginnings for each year, is given in Table 2.

Table 2—COTTON HANDLED BY LARGE-SCALE COOPERATIVE COTTON MARKETING ASSOCIATIONS, 1921-1922 TO 1949-1950

Marketing season	Number of associations operating	Cotton handled (in running bales) ¹	Per cent of total ginnings handled cooperatively ²
1921-1922	8	418,363	5.2
1922-1923	10	723,791	7.4
1923-1924	14	903,562	8.9
1924-1925	15	1,096,507	8.0
1925-1926	15	1,472,586	9.1
1926-1927	15	1,208,663	6.8
1927-1928	16	823,105	6.4
1928-1929	16	1,164,330	8.1
1929-1930	15	1,435,175	9.9
1930-1931	12	2,313,023	16.8
1931-1932	12	2,220,132	13.4
1932-1933	12	1,095,073	8.6
1933-1934	15	1,742,608	13.8
1934-1935	15	1,661,046	17.5
1935-1936	15	1,479,098	14.2
1936-1937	15	1,822,899	15.0
1937-1938	15	2,132,255	11.7
1938-1939	15	1,426,005	12.3
1939-1940	15	963,569	8.4
1940-1941	12	1,027,880	8.4
1941-1942	11	1,065,955	10.2
1942-1943	11	1,525,215	12.3
1943-1944	11	1,495,734	13.4
1944-1945	11	1,387,403	11.7
1945-1946	10	887,944	10.1
1946-1947	10	767,956	9.0
1947-1948	10	875,761	7.6
1948-1949	10	2,222,461	15.3
1949-1950	10	1,463,671	9.1

¹ Not including merchandise cotton purchased by the American Cotton Cooperative Association from 1930-1931 to 1942-1943.

² Total ginnings as reported by the U.S. Bureau of the Census.

In addition to large-scale state and regional associations, there are numerous local associations, and these generally comprise the membership of the state or regional associations. Most of the large associations are affiliated in turn with the American Cotton Cooperative Association, incorporated on Jan. 13, 1930, which super-

seded the American Cotton Growers' Exchange, organized in 1921 by the Texas, Oklahoma, and Arizona associations as a nonstock, unincorporated association.

When the American Cotton Cooperative Association was organized, its principal functions were the selling and financing of cotton received from member associations. Later it was decided that the national organization should perform other services incidental to the handling and merchandising of cotton. These included operation of interior classing services jointly with state and regional associations, and control of transportation, warehousing, insurance, hedging, accounting, billing, and invoicing. The functions of state and regional associations were confined largely to execution of general operating policies, membership contact work, bookkeeping incidental to members' accounts, and joint operation of interior classing and assembling. Subsequently, the functions of the American Cotton Cooperative Association were curtailed considerably, and more of them were performed by state and regional associations. Some of the associations are also affiliated with the Memphis Sales Service, a central agency which serves a number of local groups as well as these central associations.

Futures Markets.—A cotton futures market is a place where futures contracts are bought and sold. Such contracts provide for delivery or receipt of stated quantities of spot cotton during a specified future period at a fixed price for the basis grade and staple length. They are rigidly standardized with respect to the size of the contract unit; time, place, and manner of delivery; grades and staple lengths deliverable; margins required; classification, weighing, warehousing, and inspection of cotton; and other considerations. Transactions in futures contracts are used primarily for speculative and hedging purposes, and relatively little spot cotton is delivered against them. Transactions in spot markets, on the other hand, are made generally in connection with the actual merchandising of spot cotton. In the United States the unit of futures contracts is either 50,000 pounds, gross weight, of cotton in 100 square bales, or 25,000 pounds, gross weight, in 50 bales.

Before World War II exchanges for buying and selling futures contracts for United States cotton were located at New York, New Orleans, and Chicago in the United States; and at Liverpool, England; Le Havre, France; Bremen, Germany; and Osaka, Japan. Futures markets for other than United States cotton were located at Liverpool; Alexandria, Egypt; and Bombay, India. Most of these markets were closed during the war and have not reopened. As of 1951, the only active futures contract markets were New York, New Orleans, Alexandria, and Bombay. In the United States cotton futures ex-

changes are corporations operated on a nonprofit basis under regulations in accordance with the provisions of the Cotton Futures Act and the Commodity Exchange Act (1936).

Deliveries of cotton in settlement of futures contracts must be made from approved storage places at a designated delivery point or points during a specified month. Delivery on New York futures contracts may be made at New York, Norfolk, Charleston, Savannah, Mobile, New Orleans, Houston, and Galveston; on New Orleans futures contracts, at New Orleans, Houston, and Galveston. Government regulations of futures trading in the United States include specific provisions for additions to or deductions from the contract price for cotton of deliverable grades and staple lengths other than the basis quality—Middling 15/16 inch (before August 1939, Middling $\frac{7}{8}$ inch)—tendered in settlement of the contract. The particular designated point at which delivery is made, the day of the month on which the cotton is tendered, and the number and combination of tenderable grades and staple lengths to be delivered are at the seller's option, but due notice of intention to deliver generally must be given five business days prior to the date of delivery.

Trading personnel in cotton futures exchanges in the United States is confined to members, but a large proportion of the contracts executed are for nonmembers. Membership in the exchanges is generally limited. Thus the number of memberships in the New York Cotton Exchange is limited to 450, with a few members at times holding more than one membership. Members include representatives of most of the major domestic and export shipping firms handling United States cotton. Traders include speculators, who buy and sell mainly to profit from changes in price, and hedgers (principally cotton merchants and manufacturers), who buy and sell futures contracts as a means of transferring to speculators or to other hedgers at least some of the risks from changes in spot cotton prices.

Futures exchanges supply a continuous and ready market where changes in supply and demand are promptly reflected in price changes. Market news, assembled through the facilities of the exchanges and the Department of Agriculture, and price quotations of the exchanges, which are available to millions of persons in the United States and other countries, contribute materially to the marketing of spot cotton from the farmer to the manufacturer. The volume of trading in futures and the breadth of the market are usually such that a substantial volume of contracts may be bought or sold without greatly affecting the price level. This and futures trading in general tend to reduce seasonal changes in cotton prices and changes from one season to the next.

Prices of Spot Cotton and Futures Contracts.—*Spot Prices in Local Markets.*—The general level of cotton prices and the changes (both short- and long-time) in local markets in the United States are determined largely by the same forces of supply and demand that determine prices in the central markets and prices of future contracts. Consequently, there is a rather close correlation between the prices received by farmers in local markets and those quoted in central and futures markets. This is clearly indicated in Table 3, which gives annual average prices from 1920 to 1949. The relationship would doubtless be even closer if the prices shown were entirely

Table 3—ANNUAL AVERAGE PRICES PER POUND FOR SPOT COTTON AND FUTURES CONTRACTS, 1920-1949
(in cents)

Year	Price beginning August	Prices of spot cotton	
		Average price of Middling 7/8" or 15/16" at 10 designated markets ¹	Average prices of near-active futures contracts at New York City
1920	15.89	16.66	16.74
1921	17.00	18.09	18.67
1922	22.88	25.84	25.89
1923	28.69	30.14	30.35
1924	22.91	24.23	24.10
1925	19.61	19.68	20.20
1926	12.47	14.40	14.70
1927	20.19	19.72	19.99
1928	17.98	18.67	19.50
1929	16.78	15.78	16.43
1930	9.46	9.61	10.28
1931	5.66	5.89	6.22
1932	6.52	7.15	7.25
1933	10.17 ²	10.81	10.85
1934	12.36 ²	12.36	12.17
1935	11.09 ²	11.55	11.48
1936	12.36	12.70	12.49
1937	8.41 ²	8.66	8.65
1938	8.60 ²	8.70	8.55
1939	9.09 ²	10.09	10.18
1940	9.89 ²	11.00	11.01
1941	17.03	18.31	17.82
1942	19.04	20.14	19.40
1943	19.88	20.65	20.73
1944	20.73	21.86	22.15
1945	22.52	25.96	26.16
1946	32.64	34.82	33.48
1947	31.93	34.58	33.94
1948	30.41	32.15	30.60
1949	28.58	31.83	31.67
1950	40.07	42.58	

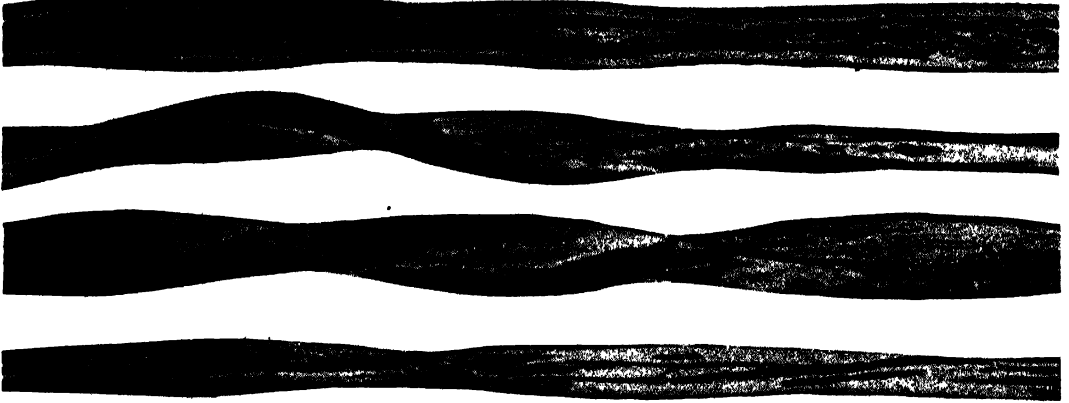
¹ Average price of 7/8" through 1938; average price of 15/16" thereafter.

² Includes unredeemed loan cotton at estimated average loan values.

comparable. As it is, however, the estimated prices received by farmers presumably represent an average of all qualities of cotton, which may differ somewhat from year to year, whereas the prices in the central markets and the futures quotations represent a specific quality. Furthermore, the prices received by farmers, which represent weighted seasonal averages, are heavily weighted with the prices existing during the fall months, whereas the market prices are simple averages of the 12 months, August-July.

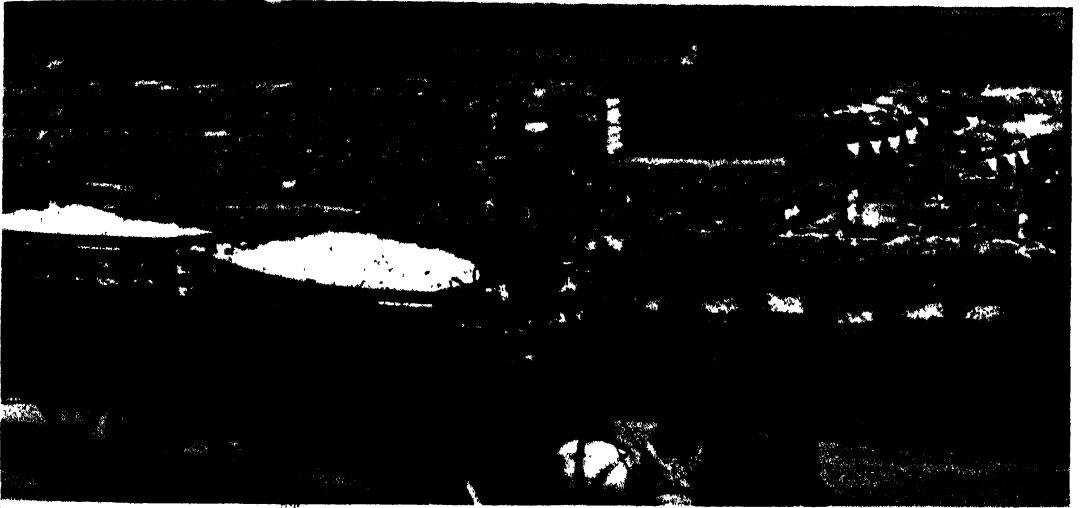
Largely as a result of differences in quality and of differences in the cost of moving cotton to consumption centers, cotton prices vary considerably from one local market to another. Studies made by the Department of Agriculture show that average prices paid to farmers in local markets tend to be relatively high in those markets where the average quality of the cotton sold is high and relatively low where the reverse is true. Moreover, average prices tend to be lower in markets where transportation costs to consumption centers are highest. One of the studies showed that in 1936-1937 growers in 5 selected local markets in Oklahoma, representing a surplus-producing area far removed from consumption centers, received prices averaging about 2.60 cents per pound lower than the average in 11 selected local markets in North Carolina, a consuming center for cotton. About 1.40 cents of the difference was estimated to be due to differences in grade and staple length of the cotton sold, and 1.20 cents to differences in transportation costs and other factors. With costs and prices much higher than in the mid-1930's, non-

COTTON



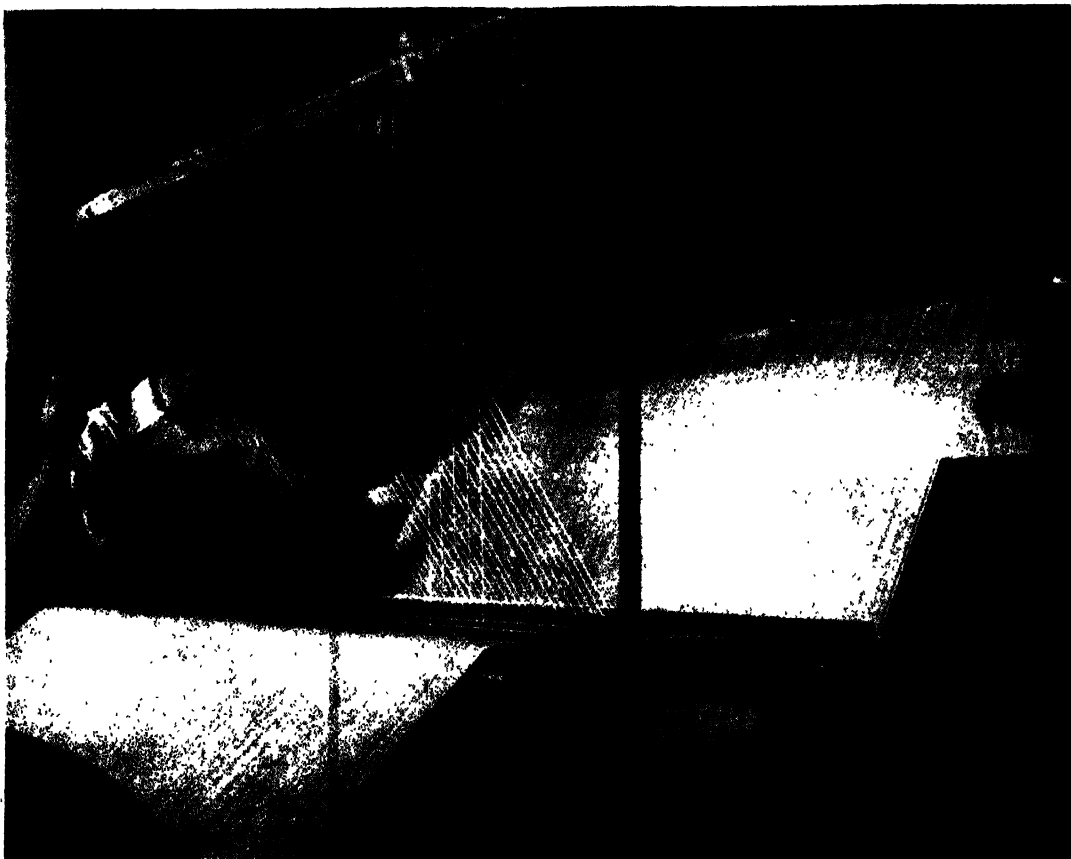
Courtesy "Textile World"

American upland cotton fibers magnified 500 times. Top to bottom: Deltapine, Stoneville, Coker, and Acala.



Photographs by Harmon, courtesy United States Department of Agriculture
Center: Cotton enroute to Texas gin; warehouse in background. Above: Taking cotton samples for grading of bales.

COTTON



Raw cotton draws closer to the finished cloth in this Alabama textile mill.



Photographs by Forsythe, courtesy United States Department of Agriculture

Here the yarn is being woven into rough cotton fabric.

quality differences in price were much greater in the early 1950's than as indicated in this study. In 1950-1951, Middling $1\frac{5}{16}$ -inch cotton in seven important markets in Texas and Oklahoma averaged 2.39 cents less than the same quality of cotton landed at mills.

In the Mississippi Delta, and in other localities where the average staple length of the cotton produced is longer than in other parts of the cotton belt, average prices paid to growers generally are substantially higher than in most other local markets. In many markets, however, it has been found that there is often comparatively little or no differentiation made in prices paid for individual bales of different quality. As a result, individual farmers may find it advantageous to sell poor-quality cotton in the market on the reputation of the community, but this practice, by lowering the average quality sold in the market, reduces the average price level in the market at the expense of those producing higher-quality cotton. As we have indicated, however, this situation has been improved.

Spot Prices in Central and Export Markets.—As in local markets, cotton prices in central markets differ somewhat from one market to another. Since prices quoted in the various United States central markets are for cotton of a particular grade and staple, however, these differences are due largely to differences in transportation costs to consumption centers and to a smaller extent to differences in terms and conditions of sale and in the character of the cotton sold. In addition to quotations on the basis grade and staple (Middling $1\frac{5}{16}$ inch), quotations for many other qualities of American upland cotton are available for some of the important central markets of the cotton belt. These quotations have been used for many years as a guide to value by merchants and others in making transactions, by bankers and others extending credit, and by insurance adjusters in settling claims. Since shortly after the passage of the Cotton Futures Act in 1916, official quotations for various qualities in central markets have been used in calculating prices for cotton of tenderable grades above and below Middling delivered in settlement of futures contract obligations.

The Cotton Futures Act, as amended directs the secretary of agriculture to require that differences between prices or values of Middling cotton and those of cotton of other grades in certain specified central markets be based solely upon the grades of the official cotton standards of the United States, and that they be the actual commercial differences established by the sale of spot cotton in such markets. To carry out these regulations, each market maintains a quotations committee whose organization and personnel are subject to the approval of the secretary of agriculture. The committee is directed to ascertain impartially and carefully, and to publish on each business day, the price or value of Middling $1\frac{5}{16}$ -inch cotton and the differences between its price or value and that of cotton of other grades and staple lengths represented by the official cotton standards of the United States. Quotations are made daily at the close of the futures market showing the price of Middling $1\frac{5}{16}$ inch and the premiums and discounts for the other grades.

Spot Prices in Mill Markets.—Because of differences in places of delivery and in terms and conditions of sale, cotton prices in mill markets

are usually higher than those prevailing for the same grade and staple length of cotton sold in central markets and in farmers' local markets. Cotton is usually offered for sale in spinners' markets in lots of 100 or more bales, even running in grade and staple length, whereas in central and local markets much of the cotton is sold in small lots, not even running in grade and staple length.

Prices of Futures Contracts.—For the most part, futures prices are determined by the same general supply and demand conditions which determine the prices of spot cotton. Short-time changes in supply and demand, however, are reflected somewhat more promptly in futures prices than in spot prices. In fact, futures prices are disseminated in spot markets and are used by buyers and sellers in arriving at prices for spot cotton. Over short periods, therefore, spot cotton prices tend to follow the lead of the prices for futures contracts. This should not, however, be interpreted to mean that the prices of spot cotton are determined by the prices of futures contracts. Prices of spot cotton and futures contracts are each influenced by the other, and both are determined largely by present and anticipated demand and supply conditions. While changes in prices of spot cotton are generally not much different from those for near-month futures contracts, they sometimes vary quite widely from their normally expected relationship. Prices for futures contracts for more distant delivery months at times vary considerably from those for near-active months and from prices for the basis quality of spot cotton at delivery points. With plenty of spot cotton immediately available in the market, the prices of futures contracts are normally expected to exceed prices of the basis quality of spot cotton at delivery points by amounts approximately equal to the cost of carrying spot cotton to the date of maturity of the futures contracts. Prices of New York futures contracts for delivery in different months, however, have varied irregularly and at times widely from the normally expected relationship. Considerable variation in the relationship between different futures markets also occurs from time to time. These variations, as well as those between delivery months, tend to be kept to a minimum by traders who buy in the market or contract month in which prices are considered relatively low, and simultaneously sell in the market or contract month in which prices are considered relatively high. When the relationships have been restored to a more nearly normal basis, the trader reverses his position, thereby profiting from the changes in the price relationships.

Price Relationships Between United States and Other Cottons.—*Relationships in a Given Market.*—For many decades Liverpool was not only one of the world's principal cotton markets, but also the only one in which prices were quoted frequently and regularly for cottons from all principal and some minor exporting countries. It provided prices for the several growths that were comparable with respect to time, place, and type of currency. In addition, it was sufficiently active so that most of its quotations were based on actual transactions. Consequently, until the end of March 1941, when the Liverpool market was closed for an indefinite period, its prices were often used in comparing the prices of different growths of cotton. A review of some of the price relationships which have existed in this and other

markets is important to a proper understanding of some of the major aspects of marketing cotton.

Average price relationships between various types of cotton for intermediate and longer periods are largely a reflection of the relative qualities and spinning utilities of the various growths. One of the leading quality factors affecting the comparative spinning utility of different cottons is staple length (together, possibly, with other elements of quality associated with staple length). The significance of this factor (and of any associated factors) in relation to comparative cotton prices is indicated in Table 4, which shows 20-

Table 4—AVERAGE PRICES AND PRICE RATIOS AT LIVERPOOL, 1920-1939

Type of cotton	Actual prices (in cents per pound)	Price as percentages of United States cotton	Approximate staple length (in inches)
Egyptian Sakellaridis, Fully Good Fair	28.97	168	1 3/8
Egyptian Uppers, Fully Good Fair	21.29	123	1 1/8
Peruvian Tanguis, Good	21.06	122	1 1/8
Brazilian São Paulo, Fair	16.67	97	7/8-1
American, Middling "Fair Staple"	17.26	100	7/8-15/16
Indian Oomra, No. 1 Fine	13.48	78	3/4-13/16

year (1920-1939) average prices and price ratios at Liverpool for several different growths of cotton, together with the approximate average staple length of these cottons. Except for the disrupting factors of World War II and the early postwar period, the inclusion of later years would probably produce approximately the same relationships.

If price data were available for exactly the same cottons in other markets, a long-time average ratio of one to the other probably would not differ greatly from those which existed in Liverpool. Thus in Osaka, where prices of United States and Indian cottons are available for the years 1920-1938, the average price of the so-called Indian Acola group was equivalent to about 79 per cent of the average price of American Middling $\frac{7}{8}$ inch. The ratio of Indian cotton to United States cotton in the Liverpool market for the same years averaged 78 per cent. While it is not known exactly how the quality of the Acola group compared with that of Oomra during this period, these price ratios suggest that the two cottons were very similar in quality. In this connection, it is significant to note the relationship between the average New Orleans prices of Middling American upland cotton of staple lengths ranging from $1\frac{3}{16}$ to $1\frac{1}{4}$ inches for the 17-year period 1923-1939, as shown in Table 5.

For the most part, there is a fairly close and direct relationship between the length of staple, the count of the yarn produced therefrom, the fineness of the fabric into which it is woven, and the price of the resulting products. These factors, together with the relationship of staple length to the amount of spinning waste and to the cost of processing, account largely for the premiums paid for the longer staples.

Questions asked of the Department of Agriculture indicate that some persons with considerable knowledge of cotton prices do not understand how over a period of years important trends

Table 5—AVERAGE PRICES AND PRICE RATIOS FOR MIDDLING AMERICAN UPLAND COTTON AT NEW ORLEANS, 1923-1939

Staple length (in inches)	Price (in cents per pound)	Price as percentages of 7/8 inch
13/16		95 ¹
7/8	14.29	100
15/16	14.70	103
1	15.06	105
1 1/16	15.66	110
1 1/8	16.44	115
1 3/16	17.75 ²	124
1 1/4	19.74 ³	138

¹ Based on 13-year average (1924-1936) for three markets.

² Average for 16 years.

³ Average for 15 years.

have occurred in the relative quantities of some of the different growths produced and consumed without being associated with a trend in the price ratios. An explanation of this should contribute to a more thorough understanding of price relationships between growths as well as of those between different qualities of United States cotton. The trend in consumption without a trend in price ratios is due to the fact that, as the price of cotton of one growth increases or decreases in relation to the prices of other growths, consumption of the relatively cheap cotton tends to increase in relation to that of the more expensive cottons. On the other hand, such shifts in consumption cause a greater relative consumption of the cotton which was or had been relatively cheap. This in turn results in shifts in the comparative prices of these growths. By such price changes and the accompanying reactions of spinners in the form of shifts to the relatively cheaper cotton, changes in the relative amounts of the various growths consumed become adjusted to changes in the supply. Hence, over intermediate or longer periods, the relative quantities of the different cottons consumed depend on the amounts available. The average price differentials or relationships over such periods, however, depend largely on differences in the physical properties of the cottons, including length, strength, uniformity, and other elements which collectively determine the spinning utility. This is true not only of cottons of different growths, insofar as they differ in quality, but also of cottons of different quality (or spinning utility) in the United States crop or that of any other country.

Although average comparative prices of various growths or qualities over a period of years largely reflect relative spinning utilities of the cottons, relative prices for short periods may be affected by a number of factors. These include (1) changes or anticipated changes in relative quantities of these cottons available; (2) changes in relative local or world demand for the different growths; (3) changes in the rate of exchange between the currency of the importing country and that of other countries, particularly one or more cotton-exporting countries; (4) changes in the relative transportation cost between the importing country and one or more of the exporting countries; (5) export subsidies; and (6) import duties.

Relationships Between Markets.—Comparative price levels in the various cotton-exporting and importing countries are important in the marketing of United States cotton. A review of central market prices in seven leading export countries (see Table 6) shows that in four of these coun-

COTTON — MARKETING AND PRICES (4)

77

Table 6—PRICES AND PRICE INDEXES OF AMERICAN, INDIAN, BRAZILIAN, ARGENTINE, CHINESE, PERUVIAN, AND EGYPTIAN COTTON IN SPECIFIED EXPORT MARKETS, 1927-1949

(August 1927-July 1928 = 100)

Year begin- ning August	American Mid- dling 15/16" at 10 markets			Indian Omra, No. 1 fine, and Jarila, fine at Bombay			Brazilian, Type 5, at São Paulo			Argentine, Type B, at Buenos Aires			Chinese, Tungchow (Nantung)— Kiangsu, at Shanghai			Peruvian, Tan- guis, Type 5, at Lima			Egyptian, at Alexandria		
	Actual price in cents	Index (per cent)		Actual price in cents	Index (per cent)		Actual price in cents	Index (per cent)		Actual price in cents	Index (per cent)		Actual price in cents	Index (per cent)		Actual price in cents	Index (per cent)		Actual price in cents	Index (per cent)	
1927	20.09	100.0		16.75	100.0		21.48	100.0		21.07	100.0		18.36	100.0		20.87	100.0		37.51	100.0	
1928	19.99	99.5		14.35	85.7		20.20	94.5		18.64	88.5		16.97	91.4		20.58	98.6		35.22	93.9	
1929	16.23	80.8		11.24	67.1		15.52 ¹	72.3		16.60	78.8		13.27	72.3		16.42	78.7		28.53	76.1	
1930	9.99	49.7		7.72	46.1		10.03	46.7		11.02	52.3		9.68	52.7		10.29	49.3		17.22	45.9	
1931	6.09	30.3		6.22	37.1		8.99	41.9		7.11	33.7		8.04	43.8		7.06	33.8		9.56	25.5	
1932	7.29	36.3		6.60	39.4		14.31 ¹	66.6		8.00	38.0		7.59	41.3		8.38	40.2		10.64	28.4	
1933	11.00	54.8		8.32	49.7		11.48	53.4		11.20	53.2		10.07	54.8		12.09	57.9		14.84	39.6	
1934	12.68	63.1		9.85	58.8		13.84	64.4		12.40	58.9		11.73	63.9		12.79	61.3		15.53	41.4	
1935	11.88	59.1		9.48	56.6		12.17	56.7		12.10	57.4		11.30	61.5		12.34	59.1		16.57	44.2	
1936	13.25	66.0		10.08	60.2		12.95	60.3		14.21	67.4		11.93	65.0		14.26	68.3		19.81	52.8	
1937	9.09	45.2		7.27	43.4		9.26	43.1		12.56 ²	59.6		8.32	45.3		11.15 ³	53.4		14.92	39.8	
1938	9.00	44.8		6.57	39.2		8.42	39.2		10.72	50.9		7.49	40.8		8.52 ⁴	40.8		11.81 ⁵	31.5	
1939	10.09	50.2		8.13	48.5		9.04	42.1		11.29	53.6		8.67	47.2		8.67	41.5		13.92 ⁶	37.1	
1940	11.00	54.8		6.62	39.5		6.91	32.2		11.61	55.1		9.13 ¹	49.7		7.74	37.1		13.76 ⁷	36.7	
1941	18.31	91.1		6.59 ⁸	39.3		8.42	39.2		15.45	73.3					10.46	50.1				
1942	20.14	100.2		10.89	65.0		11.08	51.6		13.83	65.6					13.74	65.8				
1943	20.65	102.8		9.67	57.7		13.15	61.2		13.72	65.1					16.63	79.7				
1944	21.86	108.8		16.50	98.5		14.10	65.6		15.28	72.5					15.51	74.3				
1945	25.96	129.2		16.43	98.1		17.93	83.5		20.43	97.0					18.22	87.3				
1946	34.82	173.3		16.81	100.4		25.88	120.5		30.14	143.0					24.93	119.5				
1947	34.58	172.1		21.47	128.2		28.44	132.4		37.53	178.1					28.40	136.1				
1948	32.15	160.0		23.43	139.9		33.05	153.9		46.80	222.1					31.43	150.6				
1949	31.83	158.4		17.57	104.9		32.35	150.6		41.03	194.7					30.41	145.7				

¹ Average of 10 months. ² Average of 9 months. ³ Average of 5 months. ⁴ Average of 8 months. ⁵ Average of 11 months. ⁶ Average of 6 months. ⁷ Not available. ⁸ Support prices. Compiled by the Bureau of Agricultural Economics, Department of Agriculture, from official or reliable trade sources and special reports received through the Office of Foreign Agricultural Relations.

first year for which reasonably satisfactory acreage estimates are available, to 1924 the total acreage outside the United States ranged between 29,300,000 acres and a little more than 41,000,000 acres. In 1926 the total acreage of 40,000,000 acres was 4,600,000 acres less than the record United States acreage of that year, but thereafter the acreage in the other cotton-producing countries increased in relation to that of the United States, and in 1932-1933 was approximately 6,700,000 acres greater than that of the United States. Acreage in these countries continued to increase, while that of the United States declined, and in 1937 attained a peak of almost 59,000,000 acres. As a result of World War II, the estimated total acreage outside the United States in 1945—almost 37,500,000 acres—was the smallest in 22 years. By 1951, however, the total had risen to over 53,000,000 acres.

India and Pakistan.—In India cotton acreage and production rose rather sharply from 1900 until the depression of the early 1930's. That depression, like others, brought about some recession, but the low points in acreage and production were materially above the low point of the depression of 1920-1921 and those of earlier years. Despite a substantial recovery in acreage after 1932, however, the area planted to cotton in India never recovered to within 1,000,000 acres of the peak attained in the late 1920's.

Indian cotton acreage rose from about 20,000,000 acres in 1904 and 1905 to slightly more than 26,700,000 acres in 1928, and then declined to 22,150,000 acres by 1932. After the recovery in cotton prices and the inauguration of the cotton adjustment program in the United States, Indian acreage rose to 25,500,000 acres, but during World War II declined again, and in 1945 totaled only 13,751,000 acres. It increased slightly thereafter, and in 1949-1950 the subcontinent had a total cotton acreage of 14,655,000 acres, of which 11,793,000 acres were included in the Republic of India and 2,862,000 acres in Pakistan.

In the late 1890's, Indian cotton production averaged about 2,000,000 bales annually. It increased rather sharply thereafter, and for the five years before World War I averaged about 3,500,000 bales annually. The expansion in acreage which accompanied the small United States crops and high prices of the mid-1920's resulted in a peak production of more than 5,000,000 bales annually for a brief period. From then until 1944 production ranged between 3,500,000 and 6,000,000 bales annually, but in the years 1947-1949 the combined annual production of India and Pakistan was only 2,800,000 to 3,400,000 bales.

Yields per acre averaged about 74 pounds in India in the decade before World War I. Since 1918 yields have averaged somewhat higher, and in the decade ending 1943-1944 the average was 94 pounds per acre. In the five years ending 1950-1951 the average was about 98 pounds per acre. The unusually low average yields of India are due largely to the fact that much of the cotton is grown on badly depleted soils which have been under cultivation for hundreds of years, as well as to unfavorable weather conditions existing in some parts of the cotton-producing areas, to heavy damage from insects and diseases, and to the use of unimproved seed and primitive methods of cultivation.

Egypt.—Following the completion in 1902 of the Aswân Dam on the Nile River, which increased the summer water supply and brought

large new areas under irrigation, Egyptian cotton acreage increased appreciably. After the dam had been heightened in 1912, acreage rose again and in 1914-1915 reached 1,800,000 acres, as compared with 1,300,000 acres in 1903-1904. In the years immediately preceding World War I, Egyptian cotton won wide and favorable recognition in world spinning centers, where its longer staple commanded a premium over most other cottons.

After the outbreak of World War I, there were several periods of wide fluctuation in acreage and production in Egypt. Early in the war, in fear of a food shortage, the Egyptian government issued a decree restricting cotton acreage; thus the 1915-1916 acreage and production were 32 and 26 per cent, respectively, below those of the preceding year. The restrictions were removed late in 1915, and in 1916-1917 acreage expanded 40 per cent over the previous crop year. New restrictions were partly responsible for a decline in the 1918-1919 acreage. In the inter-war period acreage was restricted from time to time by the government, primarily in an endeavor to maintain or increase the price or the premium of Egyptian cotton over cotton from other countries. Such restrictions contributed to reductions in acreage in 1921, 1927, 1928, and 1932. With the sharp decline in cotton prices accompanying the depression of the early 1930's, voluntary reduction and government restrictions reduced the acreage from the all-time high of 2,162,000 acres in 1930-1931 to 1,135,000 acres in 1932-1933, the lowest level in more than 35 years. With the subsequent advance in cotton prices and the restriction of production in the United States, the acreage restriction law was relaxed and Egyptian acreage increased sharply, rising above 2,050,000 acres by 1937. During World War II government restrictions and scarcity of fertilizers were largely responsible for acreages of less than 750,000 acres in 1942 and 1943. Before the war had ended, however, acreage began to increase again and by 1948-1949 totaled 1,496,000 acres. By 1951 it totaled 2,054,000 acres.

Yields per acre in Egypt declined from an average of more than 500 pounds in the period 1895-1896 to 1899-1900 to an average of less than 350 pounds during World War I and the immediate postwar years. Thereafter average yields rose, and after 1939-1940 again were around 500 pounds. The rather marked decline during the 20 or 25 years after 1895 may be attributed to such factors as (1) the marked acreage expansion, which probably brought somewhat less productive lands under cotton; (2) the rise, because of inadequate drainage, of the subsoil water level in Lower Egypt after the completion of the Aswân Dam; (3) the extension of canal irrigation to the basin lands, thus eliminating the annual fallow or rest period and making it possible to utilize the land 12 months a year; (4) the damage of the pink bollworm during the years after its appearance in 1913; and, possibly, (5) the changes in the proportion of the different varieties produced. The substantial increase in yields since about 1920 has been due in part to a shift from longer-staple, lower-yielding varieties to shorter-staple, higher-yielding varieties; crop rotations and improved cultural practices; and improvements in the drainage system.

Brazil.—Cotton is grown in two widely separated regions in Brazil: the southern states and the northeastern states. Soil and climatic conditions differ greatly in the two regions, and the

cotton grown is largely of distinctly different types and qualities. Southern Brazil produces cotton of the American upland type, while production in the northeastern states consists largely of Brazilian tree cotton.

The total Brazilian cotton area increased from about 780,000 acres in 1911–1912 to 6,740,000 acres in 1940–1941. A large part of this increase took place during the 1930's, for the peak acreage in the 1920's was well under 2,000,000 acres. In the early part of World War II total cotton acreage declined from peak levels, but through 1943–1944 remained at or above 5,000,000 acres. It then recovered to near the peak, but dropped again to 4,500,000 acres in 1947–1948, 4,100,000 acres in 1948–1949, and 4,700,000 acres in 1950–1951.

In 1921–1922, the first year for which separate estimates are available, the cotton acreage in southern Brazil totaled 334,000 acres, or only about one fourth of that for the country as a whole. By 1923–1924 it had risen to 464,000 acres, but declined sharply in the late 1920's, and in 1929–1930 totaled only 155,000 acres, or less than one tenth that of all Brazil. During the 1930's, however, the southern acreage increased very rapidly, and by 1940–1941 it was estimated to total 4,585,000 acres, or nearly 70 per cent of the entire Brazilian acreage. Incomplete estimates indicate that the percentage for the 1950–1951 season was also fairly close to 70.

In the northeastern states, where cotton has been the traditional crop for many years, total acreage has not fluctuated so widely as in the south. Short-term fluctuations in the northeast appear to be caused to a considerable degree by variations in rainfall, since much of the region suffers periodically from severe droughts. In general, cotton in this area is not subject to as much competition from alternative crops as that grown in the coffee-producing southern states and thus has not been as sensitive to price factors.

Brazilian cotton production, like acreage, increased greatly from the period just before World War I to the beginning of World War II. From 1902–1903 until 1918–1919, total production ranged from just under 300,000 bales to a little less than 500,000 bales, with the trend slightly upward. In the following decade, despite substantial acreage increases, there was little net increase in production, for yields per acre declined materially. In the 1930's, however, production increased substantially, and the 1940–1941 crop totaled a record 2,505,000 bales. Production declined to 1,844,000 bales and 2,172,000 bales in the two succeeding years, but in 1943–1944 rose above the level of 1940–1941 to 2,700,000 bales. From that year through 1950–1951, however, the crop ranged between 1,260,000 bales and 1,635,000 bales.

Production in the southern states increased from 81,000 bales in 1930–1931 to a crop estimated at 1,857,000 bales in 1940–1941. The latter figure was equivalent to 74 per cent of the total Brazilian crop. In 1950–1951 production in this part of Brazil amounted to 1,068,000 bales, or 69 per cent of the total crop.

In the period 1911–1931, the average annual yield per acre of cotton in Brazil declined quite materially. In the decade ending 1920–1921 yields averaged 227 pounds per acre, whereas in the five years ending 1932–1933 they averaged only about 142 pounds. At least part of this decline was due to a drought in northeastern Brazil

which began at the end of 1930 and lasted to the beginning of 1934, but other factors were also apparently important. Since the early 1930's yields have increased somewhat, the average for the three years 1940–1941 through 1942–1943 equalling 183 pounds per acre. For the three years ended 1950–1951 the yields were considerably lower than in the early 1940's.

Soviet Union.—In the last quarter of the 19th century, Russia developed a domestic source of raw cotton supply in newly won Turkestan (Central Asia) and, to a smaller extent, in Transcaucasia. The introduction of American upland types, which largely replaced the indigenous varieties, and the construction of railroads connecting the cotton regions with European Russia contributed greatly to the expansion in the period. A number of measures intended to encourage cotton cultivation, such as the imposition and gradual stiffening of customs duties on raw cotton, some agronomic assistance, and tax privileges for cotton growers, were adopted in the years before World War I. The difficulty of shipping United States cotton to Russia during the war temporarily stimulated the further expansion of Russian cotton acreage, and in 1915 the total cotton area exceeded 2,000,000 acres. Of this acreage, Central Asia accounted for 88 per cent and Transcaucasia for the remaining 12 per cent. The production of lint, which reached its prerevolutionary peak in that year, was estimated at 1,532,000 bales of 478 pounds.

Acreage and production declined sharply with the general economic dislocation which the revolution of 1917 and the ensuing civil war brought in their train. The shrinkage of the market for cotton and the shortage of breadstuffs due to the disruption of communications with central Russia led to increased self-sufficiency in the cotton regions and a shift from cotton to cereals. By 1922 the area in cotton had dropped to an estimated 170,000 acres, and production to 55,000 bales. Thereafter, with the general economic recovery during the period of the New Economic Policy (NEP), Russian cotton acreage showed a marked upward trend. By 1928 it exceeded the prerevolutionary peak and totaled 2,400,000 acres. Expansion continued, and in 1931 the area in cotton exceeded 5,000,000 acres—a figure which was almost equalled or exceeded in each succeeding year until the Soviet Union became involved in World War II. By 1930 production had recovered to the 1915 level despite much lower yields per acre. From 1931, when production totaled about 1,845,000 bales, to 1939, when production reached an all-time peak of 4,000,000 bales, the upward trend was due entirely to increased yields. Indications are that from 1940 through 1949 the Russian crop ranged between 1,500,000 and 3,000,000 bales.

Yields per acre, which declined during the years of war and revolution, showed a marked upward trend from 1921, when they averaged less than 100 pounds, to 1927, when the average was only 12 pounds below the 1909–1913 average of 276 pounds. With the expansion of cotton acreage after 1927, most of which was on non-irrigated land, yields declined to 162 pounds by 1932, but then turned sharply upward to reach an estimated 368 pounds in 1939–1940. This increase appears to have been due largely to an extensive plan for growing only the variety best suited to each area and for handling the seed stock in the best way each year, to the use of greater quanti-

period 1927–1928 to 1931–1932 into three groups according to approximate staple length. Because there were differences in descriptions and in methods of determining staple length, however, and since the reports from many of the countries were incomplete, it is not certain to what extent the figures for staple length were comparable with those for the United States, which were based on official government standards and were determined by classing an adequate sample from each year's crop. On the basis of the distribution established by the bureau, however, it was found that during this five-year period about 48 per cent of the production in countries outside the United States was less than 7/8 inch in staple, 34 per cent from 7/8 inch to 1 3/32 inches, and about 17 per cent 1 1/8 inches or longer. The estimated distribution for the United States during this period was approximately as follows: 13 per cent less than 7/8 inch in staple; 82 per cent from 7/8 inch to 1 3/32 inches; 5 per cent 1 1/8 inches or longer. Of the cotton less than 7/8 inch in staple produced in the countries outside the United States, India and China together accounted for about 95 per cent. With the Soviet Union, they also produced a very large proportion of the total production of the cotton from 7/8 inch to 1 3/32 inches in staple. The Egyptian crop, almost all of which was 1 1/8 inches or longer in staple, and that of northern Brazil constituted a large proportion of the long-staple cotton production. In addition, Peru, the Anglo-Egyptian Sudan, and Uganda produced sizable amounts of long-staple cotton.

Because of the scarcity of data, it is difficult to determine how the exact proportions of the different staple lengths produced from 1927–1928 to 1931–1932 compare with earlier years. It is known, however, that since that period the proportions of both short-staple and long-staple cottons have decreased, while the lengths most nearly comparable with the bulk of the United States crop have increased, and that this trend seems to be continuing.

India.—If the data released by the Indian Central Cotton Committee are comparable from year to year, there has been considerable improvement in the quality of the Indian crop with regard to length of staple since 1915. The committee's reports indicate that for the years 1915–1916 to 1917–1918 the quantity of cotton produced in India with a staple length mainly 7/8 inch and longer constituted slightly less than 23.6 per cent of the total. In the early 1930's, however, the proportion in these lengths averaged more than 28 per cent of the total crop, and it was still higher in subsequent years. Thus a larger proportion of the Indian crop has become more directly competitive with the bulk of the United States crop. It should be noted, however, that, according to the Indian Central Cotton Committee, the quantity of Indian cotton with a staple 7/8 inch and longer available for consumption is reduced by poor ginning and by mixing longer with shorter staples. In 1948 the committee reclassified the varieties according to staple length, placing some varieties in a lower classification, and so reduced the comparability of later estimates with those of earlier years. It is generally agreed, however, that further increases in the production of the longer staples took place in the late 1930's and the 1940's.

China.—Little information is available on the quantity of the various staple lengths of cotton

produced in China, but before the Japanese invasion in 1937 there was a significant shift from native varieties, which in the main produce short-staple cotton, to American upland varieties.

Egypt.—The proportion of the cotton acreage in Egypt producing varieties with a staple length around 1 1/8 inches, which are similar in staple length to about 5 per cent of the longer American upland cotton produced in the United States, increased materially in the 1920's and 1930's. This increase was at the expense of Sakellaridis cotton, which averages about 1 3/8 inches in staple. From about 1921 to 1923 the acreage in varieties with an extralong staple was approximately 75 per cent of the total, the remainder producing varieties with staples mainly about 1 1/8 inches long. By the early 1930's the proportion of varieties with an extralong staple had declined to less than 45 per cent of the total. This trend continued in the 1940's and the early 1950's. As a result, a larger proportion of the Egyptian crop became more directly competitive with United States cotton.

Brazil.—In Brazil the trend in the quality of cotton produced has been somewhat similar to that which occurred in Egypt. Before World War II all but about 15 to 20 per cent of the Brazilian crop was produced in the northeastern states, where a large proportion of the crop was and still is tree cotton, which is about 1 1/8 inches and longer in staple. In 1942–1943, however, more than 80 per cent of the Brazilian crop was produced in the southern states, where most of the cotton is derived from American upland varieties which produce a staple length more nearly comparable with that of the bulk of the United States crop. In the late 1940's and early 1950's the proportion of the total Brazilian crop produced in the south declined to about 70 per cent. The ginning of this cotton, formerly not very satisfactory, has improved, partly as the result of legislation.

CARRY-OVER OF COTTON

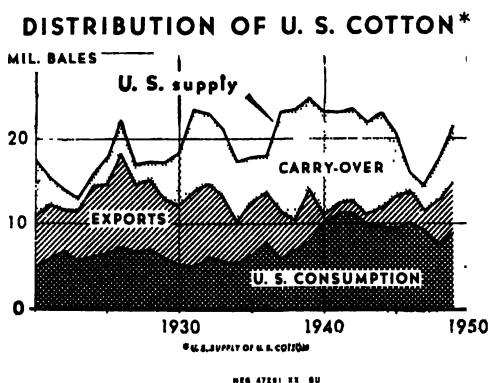
As used with respect to cotton, the term "carry-over" refers to the quantity of ginned cotton on hand as of the beginning (or the end) of the cotton-marketing season. For many years the cotton-marketing season for the United States, as well as for some other countries, has been the 12 months from August 1 to July 31. The beginning-of-season carry-over of United States cotton represents the stocks on hand as of August 1, the date on which stocks of this cotton are usually at approximately their low point for the year and before ginnings from the new crop become appreciable. Stocks of cotton in many other countries do not reach a low point as of August 1, and ginnings from a given crop often become appreciable at considerably later dates. To obtain maximum comparability, however, the most generally used carry-over estimates of cotton produced outside the United States are also made as of August 1. One of the principal uses of carry-over statistics is in combination with production data to indicate the total supply of cotton available from season to season. When so used, the production estimates should be, and generally are, adjusted to represent within-season ginnings, so that any cotton from a given crop which has been ginned before August 1 and is included in the carry-over may be excluded.

United States Cotton.—During the period 1920–1945 the world carry-over of United States

cotton ranged from a low point of 2,700,000 bales in 1924 to an all-time high of 14,137,000 bales in 1939. In the same period the proportion of the world carry-over of United States cotton in stock in the United States ranged from 45 per cent in 1925 to 95 per cent in 1944. After 1939 the world carry-over of United States cotton gradually declined, and on Aug. 1, 1948 it was estimated at 4,600,000 bales. In 1949 and 1950 the carry-over increased somewhat, but in 1951 it decreased to about the 1948 level or lower. This decline occurred largely as a result of the marked increase in cotton consumption and the reduction in cotton acreage in the United States.

During World War II, with the halting of exports to important European and Asian markets and the resulting depletion of stocks in these areas, the carry-over of United States cotton outside the United States declined sharply and on Aug. 1, 1944, was estimated at only about 600,000 bales, the lowest level since World War I and only half that of 1939. Since 1944 the carry-over of United States cotton in other countries has been from two and one-half to five and one-half times as large as in that year.

Since 1930 varying proportions of the United States carry-over of United States cotton have represented stocks owned by the government or on which the government has advanced loans. The August 1 government stocks in both categories have ranged from a low point of 41,000 bales in 1948 to a high point of over 11,000,000 bales in 1939. The remaining stocks on hand in



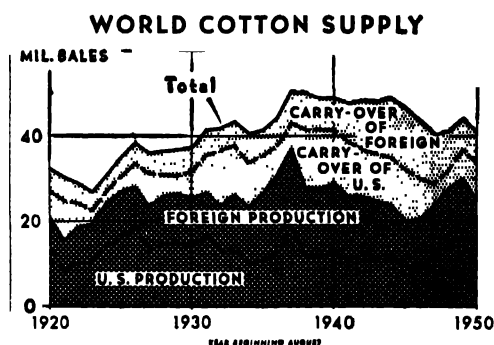
the United States as of August 1—often referred to as free stocks because of their availability for use by mills or by cotton merchants, whereas much of the cotton owned or under loan by the government has not been accessible to the cotton trade at existing prices—include stocks held by mills and merchants and small quantities in the hands of farmers.

Cotton Produced in Other Countries.—The world carry-over of cotton produced outside the United States showed a marked upward trend from 1920, the first year for which comparable estimates are available, to 1945. The carry-over of this cotton as of Aug. 1, 1920, totaled 5,400,000 bales, as compared with 7,460,000 bales on Aug. 1, 1939, and 15,600,000 bales on Aug. 1, 1945. The increase in the carry-over of cotton produced outside the United States between World Wars I and II was approximately in line with the increase in the production and consumption of this cotton during these years. The sharp increase during World War II, however, resulted largely

from the reduced imports and consumption of cotton in the Axis-controlled areas of Europe and the Far East, which more than offset increased consumption in a number of other countries. From 1945 to 1949 increased consumption reduced the carry-over of cotton produced outside the United States to the 1939 level, and it remained at about this level in 1951.

During the entire period for which estimates are available, only about 70,000 to 180,000 bales of this cotton have been carried over in the United States. Most of the United States carry-over represents cotton held in manufacturers' warehouses for use in the production of goods for which cotton grown outside the United States, because of certain quality characteristics, is better adapted than cotton available from the United States crop.

All Cotton.—The world carry-over of all cotton on Aug. 1, 1945, was estimated at about 28,750,000 bales, the largest on record and larger than the average annual mill consumption during the 1930's. This figure represented an increase of 12,000,000 bales over the 1934-1938 average and was about four and one-third times as large as the world carry-over on Aug. 1, 1923 (the small-



est for any year since 1920). As a result of three very small United States crops and a sharp recovery in world consumption, however, the carry-over was reduced by 1951 to about 11,000,000 bales, the smallest in 20 years.

INTERNATIONAL TRADE IN RAW COTTON

Although world mill consumption increased in the period between World Wars I and II, international trade in cotton failed to follow this trend. This was particularly true during the 1930's, when the volume of cotton entering international trade channels contracted considerably. In each of the seven years 1932-1938, world mill consumption exceeded the average for the decade 1923-1932, whereas in only two of these years did world cotton exports exceed 1923-1932 average exports and then only by narrow margins. As shown in Table 2, exports in 1938-1939, the last full season before World War II, fell to 11,663,000 bales, the lowest with one exception (1934) since 1923, when the United States crop was unusually small. World consumption in 1938-1939, on the other hand, totaled 28,507,000 bales, the second largest on record and about 5,300,000 bales larger than the average for the decade 1921-1930.

Import statistics (see Table 3), which are somewhat more comprehensive than export fig-

83c COTTON — PRODUCTION, SUPPLIES, AND INTERNATIONAL TRADE (5)

**Table 2—NET EXPORTS BY SPECIFIED COUNTRIES AND REGIONS,
AVERAGE FOR 1921-1930 AND ANNUALLY FOR 1931-1939¹**

Country or region	1921-1930 average	1931	1932	1933	1934	1935	1936	1937	1938	1939
United States to:	7,268	8,708	8,419	7,534	4,798	5,973	5,440	5,598	3,327	6,163
United Kingdom	1,762	1,344	1,492	1,278	738	1,410	1,144	1,552	401	1,905
France	825	463	864	709	373	681	655	716	338	724
Italy	634	649	804	649	474	380	398	506	276	542
Germany	1,668	1,570	1,849	1,318	342	766	650	656	321	19
Japan	1,012	2,294	1,743	1,846	1,524	1,479	1,550	690	864	914
Other countries	1,367	2,388	1,667	1,734	1,347	1,257	1,043	1,478	1,127	2,059
Other exporting countries	5,480	4,449	4,633	6,069	6,344	7,126	8,330	6,283	8,336	5,917
India	2,957	1,471	2,221	2,771	2,623	3,094	3,607	1,720	2,685	2,004
Egypt	1,443	1,569	1,315	1,867	1,655	1,695	1,828	1,792	1,763	1,639
Brazil	109	38	5	272	746	743	1,081	1,147	1,609	981
Peru	212	200	215	280	320	394	366	311	367	324
Anglo-Egyptian Sudan	76	143	134	124	176	215	279	278	341	147
Argentina	69	127	118	94	145	216	141	49	116	121
China	265	220	185	202	97	145	170	176	630	43
USSR	185	82	3	51	30	31	177	35		
Mexico	82	51	18	6	16	123	240	43	102	34
Turkey	76	93	42	20	60	69	101	52	114	43
Uganda	111	159	174	249	241	218	281	298	347	288
Belgian Congo	18	58	56	59	92	108	122	149	194	196
Iran	62	135	68	122	122	76	83	91	33	97
Total ⁴	12,748	13,157	13,052	13,603	11,142	13,099	13,770	11,881	11,663	12,080

¹ Exports from United States on a year beginning August 1, and in 1,000 running bales. Exports from other countries on a calendar year (except Iran, which is on a year beginning March 21 to 1930, and a year beginning June 22 from 1931) and in 1,000 bales of 478 pounds net.

² Not available. ³ 8-year average. ⁴ Sum of totals shown for the United States and other countries.

**Table 3—NET IMPORTS BY SPECIFIED COUNTRIES AND REGIONS,
AVERAGE FOR 1921-1930 AND ANNUALLY FOR 1931-1939
(in 1,000 bales of 478 pounds net)**

Country or region	1921-30 average	1931	1932	1933	1934	1935	1936	1937	1938	1939
Europe	9,218	7,465	8,061	9,346	7,957	7,707	8,636	8,957	7,204	995
United Kingdom	2,887	2,196	2,520	2,825	2,507	2,505	3,107	3,348	2,429	
Germany	1,321	1,147	1,418	1,669	1,231	1,240	1,059	1,129	1,153	
France	1,375	1,035	1,099	1,590	1,049	1,003	1,473	1,282	1,210	
Italy ¹	1,005	845	920	987	732	399	753	776	574	
Spain	370	420	466	431	450	436				58
Czechoslovakia	481	423	366	319	348	350	420	483	314	
Poland and Danzig	266	247	228	269	304	303	326	334	348	
Belgium	324	300	243	302	270	303	362	446	387	296
USSR ²	466	63	30	101	64	174	45	76	57	
Netherlands	150	211	150	166	193	179	216	275	232	264
Sweden	95	109	114	106	149	128	149	157		
Switzerland	131	111	111	120	122	122	123	156	131	181
Austria	136	106	100	117	135	160	180			
Portugal	72	68	99	100	100	108	94	139	128	
Other Europe	139	184	197	244	303	297	329	356	241	196
Asia	3,376	5,223	4,278	4,148	4,472	4,159	5,281	2,929	3,739	2,595
Japan ¹	2,892	3,674	3,234	3,590	3,646	3,784	4,693	2,098	2,757	2,552
China	324	1,078	851	354	440	108	174	176	630	43
British India ¹	160	471	193	204	386	267	414	655	352	
North America	607	338	339	469	371	443	615	454	421	664
United States ¹	361	138	136	155	112	162	265	166	157	176
Canada ¹	246	200	203	314	259	281	350	288	264	488
Total	13,201	13,026	12,678	13,963	12,800	12,309	14,532	12,340	11,364	4,254

¹ Year beginning August 1.

² 8-year average.

³ No data available from Jan. 1, 1936, to March 30, 1939.

⁴ 9-year average.

⁵ Prior to 1929, year ended September 30; beginning 1929, year ended December 31.

⁶ 9-month average. ⁷ Preliminary.

ures, confirm the contraction in international trade shown by export data. Net imports of cotton by all countries for which statistics are readily available totaled 11,364,000 bales in 1938. This was 1,837,000 bales (14 per cent) less than the average for the decade ending 1930.

In addition to the decline in the total volume of cotton entering international trade channels, there was a radical shift in the composition of this trade during the interwar period. Of the average annual world exports of 12,748,000 bales during 1921-1930, the United States supplied 7,268,000 bales or 57 per cent, while India and Egypt furnished a large proportion of the remainder. In 1938-1939, United States exports fell to the lowest level in more than 50 years, totaling

only 3,327,000 bales, and represented only 29 per cent of the relatively small volume of cotton entering international trade channels that year. Exports of non-United States growths totaled 8,336,000 bales, the highest figure on record and 2,856,000 bales more than the average for the decade ending 1930. Since the combined exports from India and Egypt were only slightly larger in 1938 than in 1921-1930, most of this increase occurred in the exports of other countries. A considerable part was accounted for by the 1,500,000-bale increase in shipments from Brazil.

A large part of the reduction in cotton exports and imports during the latter part of the interwar period was due to reduced imports by Germany, France, Italy, the Soviet Union, and

China. In 1938 there was also a rather marked drop in imports by the United Kingdom, while Chinese imports, due to unusual circumstances, rose above the 1921-1930 level.

During World War II international trade in cotton was extremely small. A large percentage of the world's spindles, most of which had previously operated on imported cotton, were under Axis control. In addition, shipping facilities were scarce, and textile production in the United Kingdom was reduced, partly because of inadequate supplies of labor. An indication of the extent to which the war reduced international trade in raw cotton and of the extent of the subsequent recovery through 1949-1950 is shown in Table 4, which compares gross exports (net exports not being readily available) for the principal exporting countries of the world.

Table 4—COTTON EXPORTS OF LEADING EXPORTING COUNTRIES, WORLD WAR II AND 1946-1947 TO 1949-1950
(in 1,000 bales)

Country or territory	Low year of World War II		High year, 1946-1947 to 1949-1950	
	Quantity	Year ¹	Quantity	Year ¹
United States	1,146	1943	6,002	1949
Anglo-Egyptian Sudan	74	1942	323	1948
Argentina	8	1941	75	1949
Belgian Congo	82	1940	235	1948
Brazil	452	1942	1,517	1946
Egypt	384	1942	1,692	1948
India ²	134	1942	1,554	1947
Iran	0	1942;	29	1949
		1943		
Mexico	2	1942	653	1949
Peru	140	1942	366	1946
Turkey	2	1945	230	1949
Uganda	103	1943	325	1949

¹ Beginning August 1.

² Less than 500 bales.

³ Including Pakistan.

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(M.R.C.)

6. MANUFACTURING AND TEXTILE DISTRIBUTION. In this section are discussed (1) the world-wide distribution of cotton spindles and looms; (2) mill consumption of cotton in the United States and other countries; (3) cotton textiles in the United States; and (4) international trade in cotton textiles.

DISTRIBUTION OF SPINDLES AND LOOMS

A very large part of all the cotton consumed in the world is used by spinning mills. In these mills the cotton is converted into yarn through a series of operations described in the article on **TEXTILE MACHINERY**. Most of this yarn is used for knitting or weaving, although relatively small quantities are used as thread, twine, or cordage. Since so much of the cotton consumed is first spun and then woven into fabric, the largest cotton-consuming countries are generally those possessing the greatest numbers of spindles and

looms. Because of the wide variation in hours of machinery operation and in the quantity of cotton required per hour of operation when producing fine or coarse yarns, however, a given country's percentage of world mill consumption of raw cotton may from time to time differ materially from the percentage of the world's spindles located in that country. The type of spindles and their efficiency also greatly influence the amount of cotton used per hour of operation. For similar reasons, as well as because of variations in the proportions of cotton yarn used in mixtures with yarns of other fibers and in the proportions of cotton yarn used for knitting, the number of looms located within various countries may not give a very good indication of the relative quantity of cotton used in the production of woven fabrics within these countries. Nevertheless, it is desirable to have estimates of the number of spindles and looms of the various countries. In some instances, for example, estimates of cotton spindles and looms are available for countries for which there are no estimates of the exact quantity of cotton consumed.

Table 1—COTTON SPINDLES AND LOOMS IN SPECIFIED COUNTRIES, 1940¹ AND 1950

Country	1,000 spindles 1940 ¹		1,000 looms 1940 ¹		1,000 spindles 1950	
Great Britain	35,837	441			29,580	
United States	25,061	506			23,286	
Germany (1939)	13,000	270			6,535 ²	
Japan (1939)	12,278	254			3,739	
India	10,059	202			10,534	
USSR (1938)	10,050	270			9,483 ²	
France (1939)	9,521	188			8,148	
China (1938)	5,635	58			4,000 ²	
Italy (1939)	5,395	138			5,566	
Brazil	2,642	82			3,284	
Spain	1,900	64			2,210	
Belgium (1939)	1,879	49			1,802	
Netherlands (1939)	1,266	51			1,170	
Switzerland	1,254	21			1,156	
Canada	1,186	24			1,117	
Mexico	830	29			986	
Sweden (1939)	650	17			555	
Portugal	600	23			536	
Hungary	335	14			281	
Argentina (1939)	329	5			512	
Finland (1939)	323	8			327	
Greece (1939)	310	8			236	
Korea (1937)	300	9			305	
Estonia (1939)	300	3			281 ²	
Egypt	264	6			499	
Manchuria (1938)	252	3			251 ²	
Rumania	250	16			230 ²	
Bulgaria	226	4			178	
Australia	180	1			223	
French Indochina	134	1			100 ²	
Colombia	133	5			307	
Yugoslavia (1935)	129	12			196 ²	
Peru	120	5			123	
Denmark (1939)	103	4			110	
Latvia (1939)	83	2			60 ²	
Venezuela	55	1			60	
Turkey	53	3			276	
Norway (1939)	50	3			71	
Chile	50	3			171	
Ecuador (1934)	44	1			48	
Guatemala	20	0.3			20 ²	
Cyprus	2				2 ²	

¹ Date in parentheses following name of country indicates that statistics are for that year and not for 1940.

² Estimated.

³ Not separately reported.

Source: *Shinner's Cotton Trade Directory of the World, 1944*, p. 61 (New York 1944); International Federation of Master Cotton Spinners and Manufacturers Association, report of June 1950.

As shown in Table 1, in 1940 (except as otherwise noted) and 1950 the nine countries possessing the largest numbers of cotton spindles were Great Britain, the United States, Germany,

Japan, India, the Soviet Union, France, China, and Italy. Except for China, these countries also possessed the largest numbers of looms, at least as of 1940. In China the number of looms reported was less than half as large as in Italy, whereas the number of spindles was slightly greater than in Italy. Altogether, there were more than 40 countries for which estimates of the number of spindles and looms on hand in 1940 or in the late 1930's were available. Estimates of the number of spindles on hand in or near 1950 are available for most of these and many other countries, but comparable data on the number of looms are available for far fewer countries. According to these estimates, the number of spindles increased in more than half the countries listed in Table 1 and declined in most of the others. A very large percentage of the countries showing increases were cotton-growing countries.

COTTON MILL CONSUMPTION

During the period 1914-1939, there was a substantial upward trend in the total world mill consumption¹ of cotton, as well as a slight upward trend in per capita mill consumption. For the years 1934-1938 world consumption averaged almost 28,000,000 bales annually. A peak was reached during the crop year 1936-1937, when world mill consumption of all cottons totaled 30,638,000 bales, a record which stood until 1950-1951. During World War II, with limited consumption in the important Axis and Axis-controlled importing countries, world cotton consumption was much lower than in the years immediately prior to 1939. Even with record high consumption in the United States, India, Brazil, and a few other countries, world consumption from 1942-1943 through 1945-1946 averaged about the same as in the depression years of 1930-1932. World consumption recovered fairly rapidly after the war and in 1950-1951 reached a new record of approximately 31,700,000 bales.

For many years United States cotton represented substantially more than half the cotton consumed by all the mills in the world. In the 1920's, despite the fact that during the early part of the decade the United States crop was materially restricted because of heavy boll weevil damage, nearly 60 per cent of the total consumption by all mills consisted of United States cotton. In the 1930's, although average world mill consumption was approximately 3,600,000 bales greater than in the preceding decade, average annual consumption of United States cotton declined nearly 1,000,000 bales and represented less than half the total. Most of the change in average annual consumption during the two decades occurred outside the United States, for consumption of all cotton and of United States cotton in the United States averaged almost the same during each of these decades. In the 1940's and in 1950-1951, world consumption of United States cotton averaged about half that of all cotton,

largely because of the high level of consumption in the United States.

Mill Consumption in the United States.—For the years 1934-1938 mill consumption of cotton in the United States averaged just under 6,500,000 bales annually, or somewhat more than the average for the years immediately before and after World War I. In view of the increase in population, however, per capita consumption of cotton showed little upward trend (except for the war period) and possibly a slight downward trend since immediately before World War I. Peak consumption before World War II was attained in the 1936-1937 crop year, when United States mills consumed 7,950,000 bales of raw cotton, 98 per cent of which was cotton produced in the United States. During the war mill consumption rose very sharply, reaching an all-time high of 11,170,000 bales in the 1941-1942 season. In the six succeeding seasons it ranged between this figure and 9,163,000 bales, and then in 1948-1949 declined to 7,795,000 bales. Mill consumption rose somewhat in 1949-1950 to 8,851,000 bales and then, following the outbreak of the Korean war, jumped to approximately 10,500,000 bales in 1950-1951, but declined about 1,000,000 bales in 1951-1952.

United States mills use relatively little cotton produced in other countries. Since 1920 consumption of cotton grown outside the United States has represented only 2 to 6 per cent of total United States consumption. This imported cotton consists of fibers which either possess certain characteristics not found in United States cotton or are not produced in sufficient quantities in the United States to meet mill requirements.

Before the Civil War a very large proportion of the United States cotton mills were located in New England. Since then there has been a steady increase in the proportion of the mills located in the cotton-growing states, particularly in North Carolina, South Carolina, Georgia, and Alabama. Immediately before World War I the mills in the cotton-growing states accounted for about half of the total United States consumption, but by 1939 the proportion of cotton consumed by these mills had increased to 85 per cent and during World War II it averaged even higher. Because of the production of coarser goods in the cotton-growing states and of the greater number of hours for which spindles are operated per week, the quantity of cotton consumed in the cotton-growing states represents a larger proportion of the total United States mill consumption than is indicated by the proportion of spindles located in these states. In January 1914, mills in the cotton-growing states accounted for 40 per cent of all active spindles, and in 1939 for 74 per cent. The trend toward these states continued during and after World War II.

Mill Consumption in Other Countries.—Total mill consumption of cotton outside the United States showed a substantial upward trend from just before World War I until the outbreak of World War II. Peak consumption was reached in 1936-1937, when 22,688,000 bales were manufactured. This was about 6,300,000 bales more than the average annual consumption during the 1920's and represented a somewhat greater increase over the annual consumption immediately before World War I. During World War II, largely because of the limited quantities of raw cotton available to mills in the Axis-controlled areas, mill consumption outside the United States

¹ In the United States and in most other cotton-consuming countries, there is ordinarily no cotton consumed except that which is spun into yarn or otherwise used in other mills, such as mattress-manufacturing establishments. In most countries, therefore, mill consumption and total consumption are synonymous. In China, India, and a few other countries, however, substantial quantities of cotton are used for home spinning and weaving on hand looms and by individuals for padding garments. The great bulk of this cotton does not enter commercial channels and so is not included in estimates of the commercial crop of these countries or, in turn, in estimates of total commercial production or consumption.

declined to less than 13,000,000 bales. Consumption rose in the late war years and in the postwar period, and by 1950–1951 it had reached 21,200,000 bales.

Despite the rather marked increase in the total mill consumption of cotton in other countries between 1920 and 1939, exports and consumption outside the United States of United States cotton showed a significant downward trend. During the years 1920–1929, these countries consumed an average of slightly more than 7,250,000 bales of United States cotton annually. The average for the following decade declined by approximately 1,000,000 bales, and the average for the last five years before World War II was nearly 2,000,000 bales lower than that for 1920–1929. As a result of the war, exports and consumption outside the United States of United States cotton from 1941 to 1944 totaled only 1,000,000 to 1,500,000 bales annually. From 1945 to 1950 consumption rose from about 2,000,000 bales to about 5,500,000 bales.

The opposite trends in the use of cotton grown in the United States and that produced in other countries by mills outside the United States from 1914 to 1939 resulted in a very sharp downward trend in the proportion of total consumption outside the United States represented by United States cotton. In 1914, United States cotton comprised 50 per cent of all cotton consumed by other countries, as compared with an average of 44 per cent in 1920–1929, 31 per cent in 1930–1939, and only 25 per cent in 1934–1938. A considerable part of this decline was caused by the increased consumption of cotton in cotton-producing countries, including India, Brazil, the Soviet Union, China, and a number of countries producing and consuming smaller quantities. The expansion of consumption in these countries did not only reduce imports of United States cotton into some of these countries, such as the Soviet Union and India. It also tended to reduce cotton imports into the United Kingdom and other European countries which had formerly exported substantial quantities of cotton goods to India and some of the other cotton-producing countries, but no longer did so as the latter became more

nearly self-sufficient or even became exporters of cotton goods. In the 1940's, United States cotton averaged about 16 per cent of the total consumption in other countries and in some of the war years accounted for only 10 per cent.

A comparison of the raw cotton consumed by the principal consuming and manufacturing countries in the period 1934–1938 and the crop year 1949–1950 is shown in Table 2. In general, these countries are those possessing the greatest numbers of spindles and looms. Their importance as cotton-manufacturing countries, however, may differ considerably from their ranking in numbers of spindles and looms, as shown in Table 1.

COTTON TEXTILES IN THE UNITED STATES

Production.—The United States cotton textile industry is generally considered to include only those mills spinning, weaving, braiding, and finishing cotton yarns and fabrics and to exclude the knitting industry, which uses substantial quantities of cotton yarns produced by the cotton textile industry. According to the function performed, almost all the mills of the cotton textile industry fall into one of the following classes: (1) spinning, including twisting and winding; (2) spinning and broad fabric weaving; (3) broad fabric weaving; (4) narrow fabric weaving and braiding; (5) spinning, weaving, and finishing; and (6) finishing.

Spinning mills perform all operations incident to the preparation and processing of raw fiber and yarn. The yarns which they produce are sold to knitters and small weaving mills and to establishments producing thread, insulating wire, twine, cordage, and mops. The spinning and broad fabric mills, which comprise the most important of the classifications, include mills spinning yarn and weaving it into various kinds of fabrics, both gray and colored, which are sold to converters, cutters, and industrial users. The broad fabric weaving mills for the most part comprise small weaving establishments which purchase their yarns and manufacture such items as damasks, draperies, tapestries, upholstery, towels, and specialty fabrics. The narrow fabric and braiding mills are usually fairly small establishments which find it more economical to purchase the wide variety of yarns needed for the tapes, webbing, laces, woven labels, and other products which they manufacture. The spinning, weaving, and finishing mills, second in importance in the industry, include almost all the largest establishments. They handle the complete process of manufacturing cotton from the yarn to the finished fabric. These mills may also finish fabrics woven by other mills, and in some instances may manufacture articles from the finished goods. Finishing mills comprise those establishments which have no spindles and looms, but which bleach, dye, and braid fabrics on commission for the account of converters or for their own account.

By far the largest part of the output of the cotton textile industry consists of broad woven goods. Excluding tire fabrics, production of these goods is classified into nine major fabric groups. The percentage which each group represented of the total yardage produced in 1950 is as follows:

Duck	2	Fine goods	12
Narrow sheeting and allied fabrics	20	Wide fabrics	7
Print cloth yarn fabrics	37	Towels and toweling	5
Napped fabrics	4	Specialties and other fabrics	4
Colored yarn goods and allied fabrics	9		

Table 2—COTTON CONSUMPTION IN SPECIFIED COUNTRIES, 1934–1938 AVERAGE AND 1949–1950 (in 1,000 bales¹)

Country	1934–1938 average	1949–1950
United States	6,454	8,851
India	2,642 ²	3,370 ²
USSR	3,020	2,300
China	2,150	2,250
Great Britain	2,741	2,092
France	1,181	1,125
Japan	3,441	1,032
Italy	693	946
Germany	1,153 ⁴	862
Brazil	645	825
Canada	265	421
Belgium	356	410
Poland	294	400
Spain	234	300
Netherlands	235	285
Portugal	88	163
Switzerland	126	140

¹ United States cotton in running bales (counting round bales as half bales); other cotton in bales of 478 pounds net.

² Burma included through 1936.

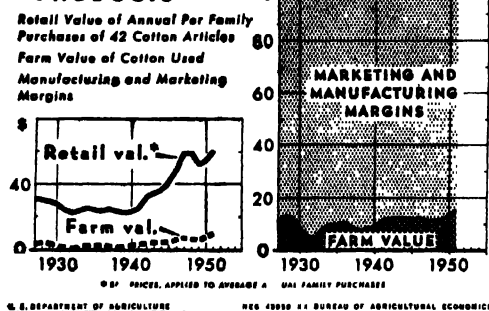
³ Includes Pakistan.

⁴ Austria and Czechoslovakia included in 1938.

Source: 1934–1938 data from records of New York Cotton Exchange; 1949–1950 data from *Quarterly Statistical Bulletin* of International Cotton Advisory Committee.

the difference between the returns to the grower for raising cotton and the cost of these goods to the consumer. In the case of cotton goods employed for industrial uses, the price of raw cotton often represents a considerably larger proportion of the total cost of the goods than it does for apparel and household goods sold at retail. Nevertheless, raw cotton still represents a comparatively small proportion of the total consumer's dollar spent directly or indirectly for cotton products. Estimates made by the Bureau of Agricultural Economics indicate that the farmer's share of the retail value of annual purchases of 42 cotton articles was 14 per cent in 1950, as compared with 11.8 to 12.8 per cent in each of the nine preceding years. Even a marked decline in the cost of producing raw cotton and in raw cotton prices, therefore, has a more limited effect on the ultimate consumption of raw cotton than if price margins between raw cotton and the goods sold at retail were not so great.

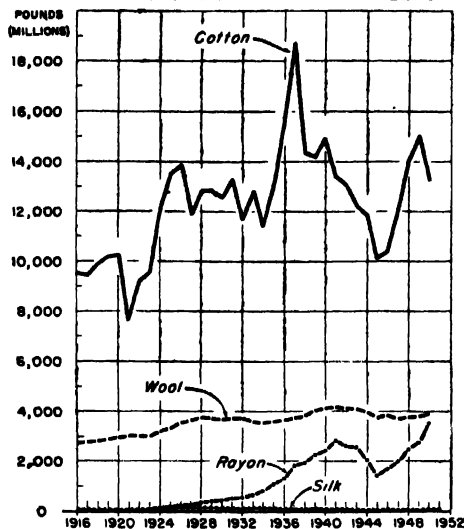
PRICES & MARGINS FOR COTTON PRODUCTS



Market Outlets in Other Countries.—In the 1920's and 1930's marked increases in the production of synthetic fibers in other countries were an important factor in restricting export outlets for United States cotton. By 1941 the estimated total production of rayon outside the United States amounted to 2,213,000,000 pounds (equivalent to more than 5,200,000 bales of cotton). This was more than 530 per cent larger than the 1931 production and compared with a total production of only 33,000,000 pounds in 1921. A large part of the increase in rayon production in the late 1930's occurred in the Axis countries and was the result of the efforts of these countries to become less dependent on imported products. After the outbreak of World War II, synthetic fiber production was stimulated further in these countries because of their almost complete inaccessibility to cotton and wool. As the war progressed, however, output was restricted appreciably, and by 1945 rayon production outside the United States had declined to less than 28 per cent of the 1941 level. It rose again in the postwar period and by 1951 had reached 2,666,000,000 pounds, equivalent to 6,273,000 bales of cotton.

Of still greater importance in limiting export outlets for United States cotton and in depressing prices received by United States cotton growers in the 1930's was the increased competition from cotton grown in other countries. The expanded production of this cotton has been discussed in the section on *Production, Supplies, and In-*

WORLD PRODUCTION OF IMPORTANT FIBERS



OFFICE OF FOREIGN AGRICULTURE

International Trade. Despite an upward trend in the total consumption of cotton outside the United States, the increase in production was even greater, and the world carry-over of cotton grown outside the United States rose substantially. As a result, annual exports of United States cotton declined from a range of 6,760,000 to 8,708,000 running bales in the early 1930's to a 50-year low of 3,327,000 bales in 1938-1939, the last full season prior to World War II. During the war the production of cotton outside the United States was greatly reduced as a result of military operations and government action to increase food production. The reduction in cotton consumption through 1944-1945, was considerably greater than that of production, however, and as of Aug. 1, 1945, the world carry-over of cotton produced outside the United States was from two and one-half to three times as large as in the early 1930's. Production and consumption of cotton outside the United States rose again in the postwar period, and by 1950-1951 production had reached 16,400,000 bales, but the carry-over of this cotton had dropped to about one half that of 1945.

Closely related to the expanding production and consumption of cotton produced outside the United States and the restricted export outlets for United States cotton is the increased mill consumption of locally grown cotton in countries formerly importing large quantities of cotton textiles. The bulk of these cotton textiles were imported from European countries and Japan, which used considerable quantities of raw cotton imported from the United States. Since 1938 the consumption of cotton and the production of cotton textiles in such cotton-producing and cotton-exporting countries as India, Egypt, Brazil, Turkey, Argentina, and Peru have increased materially, and the first three of these countries were net exporters in 1949 and 1950 of textiles made largely, if not entirely, of locally grown cotton. This switch in cotton textile production and in the source of raw cotton tends to stimulate consumption as well as production of cotton grown

in other countries. In any event, it weakens the competitive position of United States cotton in relation to that produced elsewhere.

While import duties on raw cotton are relatively minor, high duties on goods imported into the United States and other international trade barriers have restricted exports of United States cotton. In the period following World War I an increasing proportion of the limited funds available to other countries for the procurement of United States products was devoted to the purchase of automobiles and other industrial products. After World War II the United States government financed a very large proportion of United States exports of cotton and most other important products.

RESEARCH, SERVICE, AND CONTROL PROGRAMS

Federal and State Programs.—For many years federal and state agencies have attempted in various ways to assist United States cotton producers, distributors, and consumers. Among the earlier of these efforts, which are still in operation, are the work of state experiment stations and extension services and of the United States Department of Agriculture in (1) the development of better varieties; (2) the development of improved methods of farm operation; (3) the development of better methods of controlling insects and diseases; and (4) efforts to induce farmers to use better varieties and operating practices. The federal government has also aided farmers in organizing marketing associations; has issued outlook reports on cotton and other commodities; has established rules and regulations for cotton futures markets, warehouses, and, to some extent, spot markets; has issued market information; has established cotton quality standards and provided government quality classification to hundreds of thousands of cotton producers; and has provided marketing credit and in other ways attempted to strengthen the position of the cotton farmer in marketing cotton and other products. In addition, federal and state agencies have conducted extensive researches, and the federal government has provided payments designed to develop new and extended uses for cotton and other products grown by cotton farmers and has allocated funds to make increased quantities of food and clothing available to low-income farmers and nonfarmers. Various forms of federal aid have also been extended to farmers to assist them in becoming farm owners and in securing long-term and other credit at reasonable rates.

In anticipation of uncertain world conditions after World War II, the 79th Congress passed the Research and Marketing Act of 1946 to accelerate agricultural research and marketing service work. In the fiscal years 1948 through 1951, \$9,000,000 to \$19,000,000 was provided under the act to supplement other funds used for these activities. The act authorized the Department of Agriculture to make contracts with private and other research agencies under certain conditions. As a result, the department for the first time contracted for a considerable amount of research in cotton.

Other major activities of the federal government are the programs involving commodity loans, agricultural adjustment, and soil conservation.

Commodity Loan Programs.—The first gov-

ernment loan on United States cotton designed primarily to support or control the market price was made under the Agricultural Marketing Act of 1929, when the Federal Farm Board made loans on cotton through cooperative organizations on the basis of 16 cents a pound. The board made loans through cooperatives on the 1930 and 1931 crops at 90 per cent of the current market price. Under the Agricultural Adjustment Act in each year beginning with 1933 (except 1936), the Commodity Credit Corporation, an agency within the Department of Agriculture, has made loans designed to support cotton prices and to assist producers to market their cotton in a more orderly manner. The corporation's loan rates on Middling $1\frac{1}{16}$ -inch cotton, gross weight, have ranged from 8.60 cents per pound in 1938 to 31.71 cents in 1951–1952. As provided by law, the basic loan rates have been made on the basis of a specified percentage of the parity price, which is that price which would give a pound or a bale of cotton the same purchasing power as it had in the 60 months from August 1909 to July 1914. The loans have been nonrecourse loans, and as such often not only have helped to support the market price, but also have provided farmers with a guarantee against price declines. Under the loan programs, the corporation had made loans on 36,900,000 bales of cotton through July 31, 1949, but producers had redeemed, or the corporation had acquired title to and had sold, all but 3,800,000 bales. From August 1949 through February 1952 loans were made on an additional 4,100,000 bales, with repayments having been made on all but 400,000 bales.

Agricultural Adjustment and Soil Conservation Programs.—These programs have had as their main objectives (1) the adjustment of United States cotton production and other crops more nearly in line with consumption in order to increase prices and returns to growers and (2) the conservation and improvement of the soil in order to obtain higher yields per acre and lower unit production costs. Through these programs and other developments, the total acreage planted to cotton in the United States was reduced from 40,248,000 acres in 1933 to 24,683,000 acres in 1939 and to 19,990,000 acres in 1944. It rose somewhat thereafter, however, and by 1951 totaled 28,544,000 acres. Along with the reduction in acreage, the improvements in varieties planted, and the use of better cultural practices, yields per acre rose quite sharply (see section on *Production, Supplies, and International Trade*).

Under the adjustment and soil conservation programs, the federal government has made various types of payments to cooperating cotton producers and others. Total payments directly or indirectly applicable to cotton ranged between \$68,000,000 and \$266,000,000 annually from 1933 to 1943. During this period, total gross returns to farmers from the disposition of their cotton, excluding government payments, ranged between \$606,000,000 and \$1,426,000,000. Including government payments applicable to cotton, total gross returns to farmers from cotton and cottonseed ranged between \$749,000,000 and \$1,506,000,000, with government payments representing 5 to 19 per cent of the total. Since 1943 no such payments have been made directly to cotton, but many cotton growers have participated in the conservation program and have received government payments for soil-building practices.

Nongovernmental Programs.—Many private

agencies and individuals have made important efforts to improve the cotton situation and conditions among Southern farmers. These groups are so extensive that no attempt will be made to enumerate them here. Their activities relate to almost every phase of cotton production, marketing, and processing, and to some extent to the merchandising and distribution of cotton textiles as well. Outstanding among the various groups is the National Cotton Council of America, an organization representing producers, ginner, warehousemen, merchants, crushers, and spinners. Since its organization in 1938, it has spent hundreds of thousands of dollars annually in research, in the collection and dissemination of information, and in promotional activities designed to make the production, distribution, and manufacture of cotton and cottonseed more efficient and to expand the consumption of cotton and cottonseed products.

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MAURICE R. COOPER,
Research Coordinator, Agricultural Research
Administration, United States Department of
Agriculture.

COTTON BELT, the name applied to the principal cotton-growing region of the United States, extending from southern Virginia to northern Florida and westward to eastern Texas. After the Civil War the cultivation of cotton spread to the high plains of Texas and later to California, Arizona, and New Mexico.

COTTON FAMINE, the name given to the destitution produced in the English cotton-manufacturing districts, especially in Lancashire, by the American Civil War. With the blockade of the Southern ports, the cotton supply failed and English millowners were forced to close their factories, reducing nearly 2,000,000 persons to great distress. A relief fund was established, and loans were granted to the guardians of the poor for relief works. With the receipt of increased supplies of cotton from India, Brazil, and other areas, conditions gradually improved, and by July 1865 they had returned to normal.

COTTON FIBER. See MINERAL WOOL.

COTTON GIN, a machine which separates the cotton fiber from the seed, patented on March 14, 1794, by its inventor, Eli Whitney (q.v.). The invention is attributable in part to Mrs. Nathanael Greene, widow of the Revolutionary general, on whose plantation near Savannah, Ga., Whitney was residing at the time. Interested by a number of ingenious household contrivances he had produced, Mrs. Greene introduced him to certain gentlemen who had discussed the desirability of finding some mechanical means of separating cotton from the seed. Removal of the seeds by hand was so difficult that it required a day for one person to clean a pound of cotton. Whitney went to work at once and produced his machine within 10 days. The gin devised by Whitney consisted of a revolving spiked roller which pulled cotton through iron grids, the latter holding back the seeds, while a revolving brush removed the fiber from the spikes on the roller. The first cotton gins, operated by hand, cleaned about 50 pounds of cotton a day. In 1796 circular saws were substituted for the spikes on the roller, but in all essentials the saw gins which have been used in the cotton industry ever since correspond to Whitney's invention.

COTTON GRASS, the name applied to any sedge of the genus *Eriophorum*. About 10 species are distributed in bogs and other moist places in the Northern Hemisphere. The fruit is clothed at the base with a cottonlike substance which has been employed in making paper.

COTTON GUM, a large tree (*Nyssa aquatica*) found from Florida to southern Virginia and westward to Texas, Missouri, and Illinois. It may reach a height of 100 feet and a circumference of 3 to 4 feet. The wood is soft, though hard to split, and light brown in color. The tree is also called tupelo or tupelo gum.

COTTON MULE, a small mule of the southern United States. See MULE.

COTTON SEED. See COTTONSEED AND COTTONSEED PRODUCTS.

COTTON STATE, a nickname for Alabama.

COTTON WHIGS. See WHIGS.

COTTON WOOL, a name for raw cotton. The term is used to denote cotton used in an open, or untwisted, or unspun form for particular purposes such as stuffing automobile seats, interlining clothes, and lining boxes. In its more refined state, after treating with disinfectants, it is extensively used for surgical dressings. It is also important in the manufacture of gun cotton. Generally cotton wool is made of linters, or the short fiber removed from cotton seeds, or from other short fibers removed in the process of carding and combing lint cotton in the process of manufacture.

COTTONIAN LIBRARY, a valuable collection of ancient manuscripts, books, and coins, begun by Sir Robert Bruce Cotton (q.v.) and augmented by his son and grandson. His grandson, Sir John Cotton, desirous of making the library

a public one, an act of Parliament was passed in 1700 for this purpose; in 1707 another act authorized the purchase of Cotton House and library on behalf of the queen and her successors; and in 1730 it was deposited in a house in Westminster. The next year a fire broke out there, wherein 114 volumes of manuscripts were burned, lost or entirely defaced, and 98 rendered imperfect. A great number of the injured volumes were effectively restored, so that the library consists of nearly 900 volumes. Nearly 200 are state papers of the greatest value covering the diplomatic relations of Europe from the reign of Edward III to James I. It was then removed to a new building in Westminster, and in 1757 finally removed to the British Museum. In addition to manuscripts, it contains many valuable coins and antiquities.

COTTONMOUTH. See MOCCASIN SNAKE.

COTTONSEED AND COTTONSEED PRODUCTS. More than 2,000 years ago the Hindus mastered the use of the cotton fiber, demonstrating its remarkable adaptability for spinning into fabrics. The Hindus and the Chinese also recognized the value of cottonseed and developed crude methods for expressing its oil. They used this oil for their lamps and for medicinal purposes; the remainder of the crushed seed they fed to their cattle. But it remained for machinists and chemists in the United States to demonstrate the full potentialities of cottonseed, that it would furnish valuable food for man, feed for animals, and hundreds of other products of a wide range of usage.

Early Experiments.—A Dr. Otto of Bethlehem, Pa., is credited with the discovery of the first cottonseed oil produced in America. Samples of oil which he had obtained from cottonseed and several other vegetable oilseeds were exhibited in 1768 before the American Philosophical Association, accompanied by the statement that a bushel and a half of cottonseed would yield nine pints of oil. In 1783 the London Society for the Encouragement of Arts, Manufactures and Commerce offered a prize to any planter of the British West Indies who would express a ton of oil from cottonseed and produce five hundredweights of cake suitable for cattle feed. There is no record that anyone qualified for this prize.

Numerous experimental attempts were made to utilize American cottonseed, but the records of these are obscure. In 1799 a patent for "a process of extracting oil from cottonseed" was granted to C. Whiting of Massachusetts. In 1814 a machine for hulling cottonseed was patented by John Lineback of Salem, N. C. Details of both patents were destroyed by fire and it is not known whether either process was used. As early as 1802 it is reported that Capt. Benjamin Waring of Columbia, S. C., operated an oil mill, where he crushed flaxseed, sesame seed, and some cottonseed. Another record refers to Waring's mill in 1826, but says nothing about cottonseed. This would indicate that the processing of cottonseed had not then developed into a commercial enterprise.

In 1829, Francis Follet of Petersburg, Va., obtained a patent on "a machine for hulling and husking cottonseed and separating the hulls from the kernels." Follet in partnership with Jabez Smith, also of Petersburg, erected in that city a

mill which operated for a time and created considerable interest. Seed were crushed between a pair of revolving stones. Hulls and kernels were separated by a current of air from a fan. Power was supplied by two horses. It was claimed that the mill could hull and clean 20-25 bushels of seed an hour, yielding about 55 per cent of kernels (by weight). A bushel of kernels, it was stated, would produce more than 2 gallons of oil and 35 pounds of cake.

Follet and Smith reported in 1833 that they had erected three mills and that others, employing their machines, were rapidly progressing. They sold their patent rights for most of the Southern states to A. Plummer and Company, who were instrumental in the establishment of mills at Raleigh, N. C., Natchez, Miss., Florence, Ga., and Mobile, Ala. The largest of these, at Natchez, was capable, it was stated, of producing 1,000-2,000 gallons of oil daily. It is doubtful, however, that so large a quantity ever was produced. In 1836 a New Orleans journal reported the arrival of the steamer *Lamplighter* from Arkansas with 20 barrels of cottonseed oil and 20 tons of cottonseed cake, which possibly were products of the Natchez mill. Few details are available regarding these early mills including "a Cotton Seed Oil Factory and Insurance Company" incorporated by the Louisiana legislature in 1835 to be established in New Orleans. The Natchez mill is reported to have operated for about 10 years, but it and all the others failed.

The principal obstacle to all these early attempts to utilize cottonseed was the hull of the seed which, in American Upland varieties, is tough and covered with short fibers or fuzz known as linters. Early equipment ground up the hulls with the result that they absorbed a significant quantity of the oil. A low yield of oil and cake or meal of poor quality made the processing operation uneconomical. In addition to mechanical difficulties the problem of transportation was formidable. Seed had to be brought to mills over roads which were little more than trails. Transportation facilities for the shipment of products from mills were meager and markets were practically nonexistent, since the public generally was unfamiliar with cottonseed products and their uses.

Despite these difficulties there were a few men in the South who were not discouraged by the failure of the early mills. Among them were Dr. Edward J. Coxe and William Wilber of New Orleans. These men kept the subject alive by repeated statements in the press and periodicals that 100 pounds of seed would produce 2 gallons (15 lbs.) of oil, 48 pounds of seed cake and 6 pounds of soap stock. They pointed out that planters were discarding the seed from a 3,000,000-bale crop, which could be made to yield them millions of dollars. In 1854, Wilber constructed a mill at New Orleans. He and Frederick Good made a number of improvements in mill machinery. They produced oil, refined it, made soap, and placed cake on the market. About the same time two other mills were built at New Orleans, two at Memphis, Tenn., and one each at St. Louis, New York City, and Providence, R. I. Significantly, each of these mills was located at a point where seed could be brought to them by water. Cottonseed, being light and bulky, have always depended upon economical transportation. In the 1940's the greater part of the cottonseed that was crushed moved less than

100 miles to the mills, although the average distance increased after World War II.

Commercial Expansion.—In 1857, William R. Fee of Cincinnati invented a huller, which employed the principle of the modern machine. All previous efforts along this line had involved machines which ground up the hulls, resulting in inefficient separation of hulls and kernels and a high loss of oil. Fee's machine cut the hulls, thus making possible efficient separation, higher yields of oil and a better quality of cake. Fee also developed a hydraulic press, the type now most widely used. Several other patents issued in 1869 were important. One was for a huller developed by F. A. Wells of Memphis; two for linter machines were issued to W. F. Pratt of Bridgewater, Mass., and to G. W. Grader of Memphis. As a result of these inventions the industry, for the first time, was supplied with reasonably efficient equipment for two of the essential processes in cottonseed crushing: delinting and hulling.

The Civil War naturally retarded expansion of the industry. Of the seven mills reported by the census of 1860, only three survived the conflict. The almost complete destruction of the South's capital delayed development immediately after the war. The number of mills rose to 26 in 1870 and to 45 in 1880, but the next decade saw a very rapid expansion to 119 mills in 1890.

When the early experimenters sought methods of producing oil from cottonseed, they envisioned the oil as an illuminant which someday would replace whale oil, then widely used for that purpose. During the siege of one southern city during the Civil War, a merchant advertised that his supply of candles was exhausted but that he had received a supply of lamps equipped to burn cottonseed oil. However, the discovery of petroleum, about the time that the cottonseed industry was starting, eliminated whatever possibilities may have existed in the field of illumination. Throughout the early years there had been repeated assertions that cottonseed oil would make an excellent food, comparable to olive oil, and it was in this direction that markets developed.

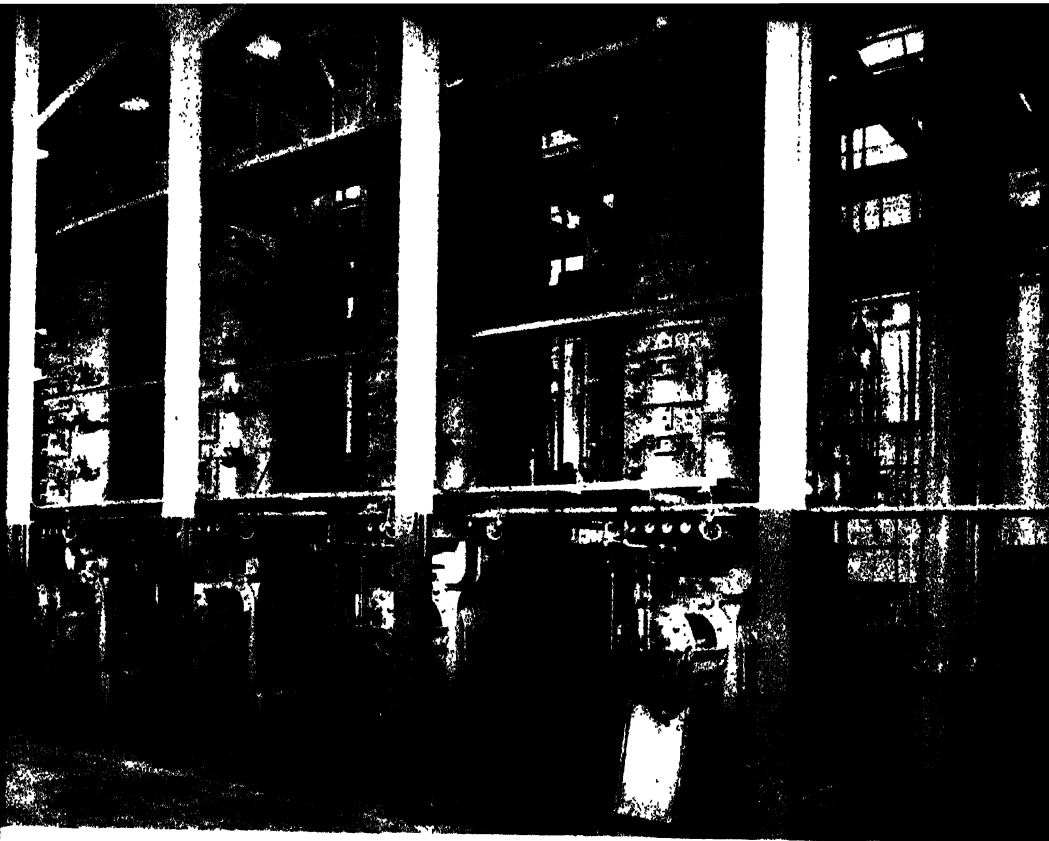
Public acceptance of cottonseed oil as a food in the United States was slow. During the decade 1870-1880, when the industry was establishing itself, most of the oil produced was exported. Interestingly enough, Italy was the principal export market, taking about 40 per cent of the exports until 1880. France also was an important buyer. There is little doubt that a large proportion of these exports to Mediterranean countries was mixed with olive oil and sold under that name. The trade journals of the period frequently commented to the effect that large quantities of cottonseed oil, which left the South under its true name, returned to the United States, especially to New York City, as olive oil. The situation led Italian olive growers to demand protection. After 1881, when Italy more than doubled its import duty on cottonseed oil, United States exports to Italy practically ceased.

This decline in exports became general as a result of important developments in the domestic market. Most of the domestically consumed cottonseed oil had gone into soap. The quantity usable in that way was limited and the men interested in its production were convinced that cottonseed oil possessed many of the qualities of a high-grade edible oil. They naturally wanted

to develop this market, which would bring greater returns than would sale of the oil for soap. During the 1870's there was introduced into the United States from France a new product: oleomargarine (or margarine, as it is now known). At first margarine was manufactured only from animal fats. Beginning about 1880, however, cottonseed oil was used in margarine, first in small amounts, but later in increasing quantities. Thus appeared a new domestic market for cottonseed oil.

In the early days the effect of margarine on cottonseed oil was more indirect than direct. It was the practice of the meat packers at that time to sell their lard to refiners, who hardened it by the addition of other fats, particularly tallow and stearin, and sold it under their own name. Two of the principal ingredients of margarine in those days were neutral lard and oleo oil. The latter is produced from the best grades of edible tallow and yields, as a byproduct, oleo stearin. The demand of the margarine manufacturers for neutral lard left the lard refiners with a somewhat inferior product. Likewise their demand for oleo oil sharply reduced the quantity of high-grade tallow, which the refiners used to harden lard. There was available, however, a large supply of hard oleo stearin. From this situation arose the practice of mixing lard, oleo stearin, and cottonseed oil. This practice aroused the antagonism of the hog producers and dairymen who sought to legislate the new competitive products out of existence. No doubt there was at the time just cause for complaint. The mixture of cottonseed oil and lard was sold as refined lard. Manufacturers apparently did not try to keep the matter a secret, for it was widely discussed in the trade journals. However, consumers were probably unaware that they were not buying pure lard. There is also little evidence of fraudulent intent on the part of margarine manufacturers, but, after the product had left their hands, it was no doubt frequently sold as butter. This situation was not peculiar to products made of cottonseed oil. The period was one of widespread adulteration of food and other commodities. The advocates of reform of this situation fell into two groups: those who wanted general legislation to protect the consumer and those who desired specific legislation dealing with individual commodities, from which they might obtain competitive advantages. Because of its political strength the dairy industry had considerable early success in their campaign against margarine. In several states the production and sale of the product was prohibited and a federal margarine law was passed in 1886. This statute imposed annual license taxes of \$600 on manufacturers, \$480 on wholesalers, and \$48 on retailers and a product tax of 2 cents per pound. In 1902 the tax was raised to 10 cents per pound on yellow margarine and reduced to 0.25 cent per pound on white margarine. Wholesalers and retailers of the latter product were taxed \$200 and \$6 respectively. The original federal margarine law preceded by 20 years the first federal Food and Drug Act. While there were no doubt good reasons for the regulatory provisions of the law, an examination of the congressional hearings and debates reveals that the suppression of competition was a strong motive behind the tax features.

Attempts were made to pass similar legislation affecting mixtures of lard with other fats



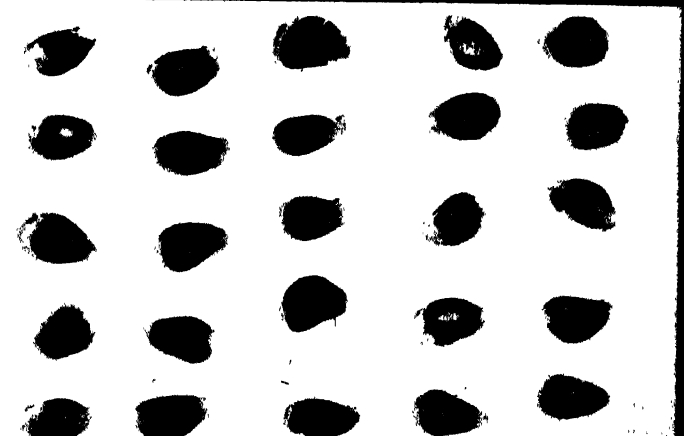
COTTONSEED AND COTTONSEED PRODUCTS

Above: Cookers and screw presses in a cottonseed oil mill.

Right: Cottonseed before delinting—actual size. *Bottom right:* Cottonseed after delinting.

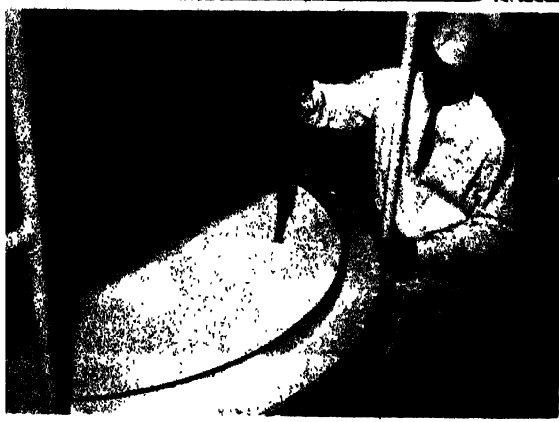
Below: Inside a seed house—vertical air ducts at right, and other air ducts under the timber construction in the foreground.

National Cottonseed Products Association, Incorporated





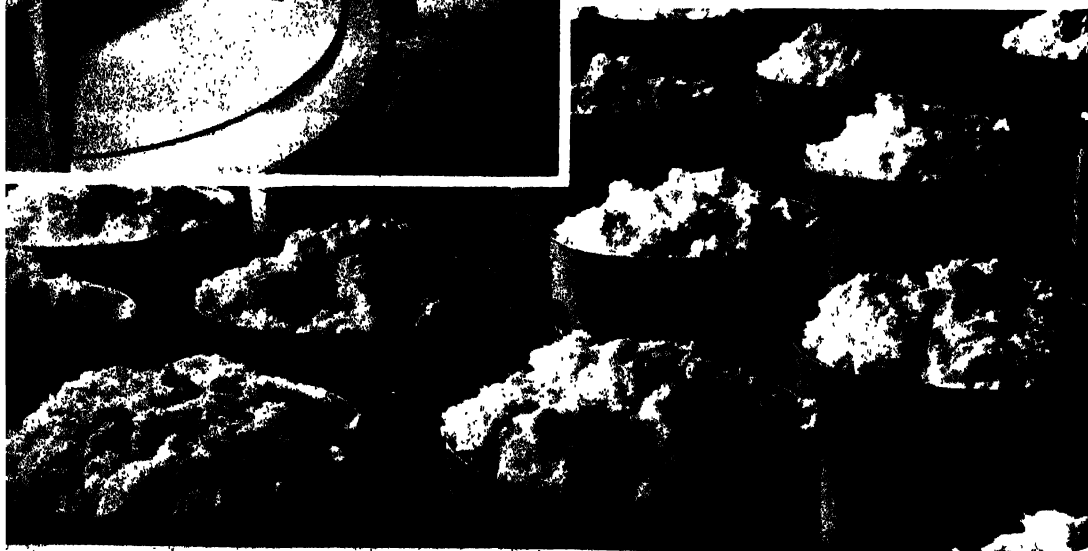
Above: A worker removes from the press a block of gun cotton made from the pulp of linters, the lint from cotton seeds.



Left: A mixture of cottonseed oil and skim milk is tested for temperature before being churned into margarine.

Below: Bleached and scoured to a fluffy mass of pure cellulose, linters shown here are ready to be used in the manufacture of cellulose acetate butyrate plastic.

(Above and left) National Cottonseed Products Association Incorporated.
(below) Tennessee Eastman Corporation



and oils, but they were not successful. The lard refiners were learning a lesson from the fate which had befallen the margarine industry, for, as early as 1888, the two largest firms in the business announced that in the future their products would be labeled "lard compound."

One phase of the drive against lard mixtures and margarine was the attempt to show that such products were impure and even dangerous to health. This effort reacted to the benefit of cottonseed oil, for it was subjected to innumerable critical tests. The verdict was uniformly favorable to cottonseed oil. The chemists testified not only that it was not harmful, but also that it was a pure and wholesome food. While the federal taxes imposed upon margarine in 1886 seriously retarded the growth of that industry as a market, cottonseed oil made marked progress in the field of cooking fats. The lard refiners' production of an acceptable shortening made from cottonseed oil, lard, and other fats led to the emergence of a wholly new industry, later to be known as the shortening industry. The term "refined lard" was gradually discarded and at least 20 trademarked brands of cooking fat were placed on the market during the 1880's. In the next decade 45 new brands were introduced. Most of these contained cottonseed oil.

Significant improvements were made in the technology of oils and fats from 1885 to 1915. The development, by David Wesson, of the caustic soda process of refining cottonseed oil was one of these improvements. Bleaching with fuller's earth and deodorization with steam under a vacuum greatly increased the value of the oil as a food. Finally the perfection of hydrogenation, by means of which a liquid oil may be transformed into a solid fat, made possible the production of a shortening composed entirely of cottonseed oil. The first such product was placed on the market in 1911 and was widely advertised as an all-vegetable product.

Growth and Maturity.—The expansion of the crude oil mill industry in the South kept pace with improvements in technology; in fact, it exerted a constant pressure upon the chemists and refiners to make such improvements. In 1874 the United States cotton crop was 3,836,000 bales. Seed crushed, however, was only 84,000 tons or 5 per cent of production. By 1900 the cotton crop had increased to 9,535,000 bales and the quantity of seed crushed had risen to 2,479,000 tons or 53 per cent of production. The number of mills, which had reached 119 in 1890, increased to 369 by 1900 and rose to a peak of 882 in 1914.

As early as 1897 there was formed the Inter-State Cotton Seed Crushers Association, with 143 members representing crude mills, refiners, dealers, brokers, and supply firms. In 1898 the association adopted a set of trading rules, which defined certain trade terms and established standards for cottonseed oil and meal. These rules and standards have been improved and expanded over half a century and still serve the industry. The association has maintained a continuous existence, although in 1929 its name was changed to the National Cottonseed Products Association. After 1914 the number of cottonseed crushing mills declined until in 1950 there were about 330 plants in operation. This decline resulted from the decrease in production of cotton in certain areas and from the manner in which the industry developed. As already noted, transportation facil-

ities were very poor when the industry began its growth. Since seed could not be brought readily to centrally located plants, a large number of plants were erected close to the seed. As transportation and marketing facilities improved, each mill was able to extend the area within which it could buy seed. The industry became intensely competitive; poorly located or designed mills and those under poor management went out of business. While the number of mills declined, the percentage of seed production that is crushed rose to nearly 90 per cent. The capacity of the industry is more than sufficient to handle any size of crop which may be produced.

Marketing.—Cottonseed are separated from the cotton fiber at the gin. In most instances, producers sell their seed to the ginner at the time the cotton is ginned. The ginner combines the small lots of seed purchased from producers and sells in multiple-ton lots to the crushing mills.

Movement of seed to the mills is highly seasonal. Over 80 per cent of the crop reaches the mills during the four months ending with December. To handle this rapid movement, most of the mills operate 24 hours a day during the fall and early winter months. Even so, it is necessary for the mills to provide extensive storage facilities to care for the crop.

Mills base the prices they pay for cottonseed upon the total value of the products obtainable from a ton of seed. From this total value a mill will subtract its costs. It will also subtract the amount of profit it hopes to earn in return for risking its capital. What remains is, in theory, the price the mill will offer per ton of seed. Actually, the mill must meet its competitors' prices, even at the expense of some or all of its profit, or it will be unable to buy seed.

Mill Processes.—Most cottonseed are delivered to the mills by truck, but a small quantity comes by rail. Seed are unloaded chiefly by power shovel or pneumatic unloaders. A few mills employ hydraulic truck dumpers. As seed are unloaded, a sample is taken by a licensed sampler and is sent to an official chemist, who analyzes it for moisture, foreign matter, oil and protein content, and free fatty acids in the oil. On the basis of this analysis the chemist determines the grade of the seed and the mill bases its price upon that grade. Upon unloading, seed are carried to the seed house by mechanical conveyor. The seed house is usually a large, rectangular, steel building, notable for the 45° angle of its roof. Some mills employ tanks, either steel or tile, for seed storage. Regardless of the type, facilities for storage of cottonseed are equipped with mechanical cooling systems, which draw outside air through the seed. Most mills seek to bring the temperature of stored cottonseed below 60°F. as rapidly as possible. Such cooling is essential to preserve the quality of seed to be stored for any significant period.

Cleaning.—The first operation in the processing of cottonseed is that of cleaning. Seed are run over revolving and shaker screens and through pneumatic equipment to remove the various types of foreign matter that are present. Magnets are also employed to remove any metal, such as nails, which may be mingled with the seed. After cleaning, seed go to the lint room, where the short fibers are removed. The lint room, in both appearance and operation, is not unlike a cotton gin. The seed are fed into delinting machines, where they fall into a set of

ribs. A series of circular saws on a horizontal revolving shaft projects through the ribs just far enough to catch in the short lint. The saw teeth carry the lint through the ribs, leaving the seed behind. At the back of the saw the lint is removed by a brush revolving with the saw, but at a higher speed. The lint is collected from the brush by a reel or by air suction, passed to a condenser, and baled. It is known in the trade as cotton linters. Seed may be run through the delinting machines once, in which case the linters are known as mill run; or they may be run through twice and the linters are classed as first cut and second cut. The latter practice is used by most modern mills.

Removal of Hull.—In cottonseed processing, the next step after delinting is the removal of the hulls. This is performed usually by a bar huller, consisting of a concave bank of horizontal stationary knives held close to a second series of horizontal knives carried on a rotating cylinder. Seed are fed between the two sets of knives, which cut the tough hulls. From the hullers seed move through beaters, shakers, and separators, which loosen and then separate the hulls from the kernels or meats. The latter are then ready for the extraction of the oil.

Extraction of Oil.—There are three processes for the removal of oil from cottonseed: the hydraulic press; the expeller press; solvent extraction. The oldest and most widely used is the hydraulic press. The meats are passed through a series of heavy steel rolls, which flatten them into flakes. In this form they are fed into steam-jacketed cookers equipped with stirring blades and moisture controls. Cooking time varies with the volume of meats handled. Generally it ranges from 80 to 120 minutes at temperatures of 200°-225°F. A shorter cooking period and higher temperatures are employed in certain types of pressure cookers.

As they leave the cooker, the meats are run through a former, which shapes them into slabs that will fit into the press boxes. These slabs then are wrapped in very strong wool or nylon cloth, known as press cloth, and are then ready for the press. The hydraulic press consists of a series of rectangular steel boxes, one above the other. The entire press rests upon a vertical, hollow, steel cylinder, inside of which operates a plunger or ram. Base and head of the press are connected by four steel posts. When the slabs of meats have been placed in the press boxes, hydraulic pressure is applied to the ram, which presses each box against the one above it and the top box against the head of the press.

Pressure is increased to about 2,000 pounds per square inch (on the cake surface). Oil is forced from the meats and through the press cloth. It flows between the press boxes and into a collecting pan at the bottom of the press. There it is piped to settling tanks, where fine particles of meal settle out. It then is pumped to storage tanks or directly into tank cars for shipment.

Cottonseed meats usually are kept under pressure for 20 to 40 minutes. When the available oil has been expressed, the slabs of cake are removed from the press and run through a cake stripper, which removes the press cloth. In some instances, the edges of the cake are trimmed and reworked for the oil which they contain. The cake is put through a cake breaker, which cracks the slabs into smaller pieces. These may be screened into various sizes, for sale as cracked

cake, or fed into an attrition mill, which grinds them into meal. Meal may be processed further by moisture, heat, and pressure into cubes or pellets. Cubes and pellets have the advantage of being easy to handle and uniform in texture and composition.

While most cottonseed are processed on the hydraulic press, a significant number of mills use the expeller or screw press. In this operation seed move through the same steps previously described, up through the rolls. From the rolls the flaked meats pass to a cooker or conditioner, which is part of the press. There they are brought to a proper temperature and moisture content. The expeller press resembles a large meat grinder, in that it has a screw or worm revolving inside a horizontal steel barrel. Meats flow from the conditioner into one end of the barrel, where pressure created by the revolving screw expels the oil, which then flows through small openings in the underside of the barrel. The cake, in flaked form, is extruded at the other end of the barrel. Very high pressures, up to 10-12 tons per square inch, are created in the press. The expeller is a continuous-process operation and can be worked with much less labor than the hydraulic press system. It, however, requires more power.

The third method of obtaining oil from cottonseed is solvent extraction, which has been used in Europe and in the American soybean industry for a number of years. The process has been most successful, when used on raw materials with a relatively low oil content. Cottonseed meats, containing about 35 per cent oil, have raised some difficult technical problems. These are being overcome, however, and a number of mills have installed solvent systems and others are making such installations.

In solvent extraction, cottonseed are put through the regular milling processes up to the point where they leave the rolls. The flaked meats then are exposed to one of several solvents, which dissolves the oil. Solvent and oil are separated by a series of evaporators and stills, while any solvent remaining in the meal is removed by light pressing and heating. Solvent extraction has the advantage of recovering 30-40 pounds more oil per ton of seed than hydraulic or expeller processing. When the price of oil is high, this is a significant advantage to the processing plant. Solvent extraction also requires considerably less labor than hydraulic processing, although operators must be men with intensive technical training. The sharp rise in wage rates, which occurred in the 1940's, has encouraged the installation of expeller and solvent operations.

Cottonseed Products.—The quantities of products, which the mills recover from a ton of cottonseed, are subject to considerable variation. A study of official grade reports shows that the seed crushed during a single season in Tennessee produced from 145 to 395 pounds of oil per ton. Meal yields on the same seed varied from 693 to 1,036 pounds per ton. Comparable variations occur in other states. Such variations may be attributed to the variety of the cotton planted, to cultural practices, and to climatic conditions prevailing during growing and harvesting seasons. While the variation in the quantity (and the quality) of products obtainable from individual lots of seed is quite wide, national average yields are reasonably stable, as shown in the following table, which records in pounds the aver-

age quantity of cottonseed products produced per ton of seed crushed, 1940-1949 crop years (beginning August 1):

Crop year	Oil	Cake or meal	Hulls	Linters
1940	324	888	504	171
1941	312	874	495	186
1942	311	887	482	190
1943	313	928	469	185
1944	311	919	463	182
1945	312	879	480	182
1946	315	882	471	191
1947	312	930	452	186
1948	320	897	463	183
1949	323	893	469	179

The extent to which mills can vary the quantity of products obtained per ton of seed is strictly limited. The yield of cake or meal may be increased somewhat by permitting more hulls to remain with the meats. This, of course, reduces the yield of hulls. It also reduces the protein content of the meal, which is the basis of its value. If an excessive amount of hulls is left in the meats, the yield of oil will be reduced through absorption. The yield of linters may also be varied moderately, both in total and as between first and second cuts. Some variation in linters output per ton of seed may be noted from one season to another in response to changes in the market price.

Oil.—Oil is the most valuable product of cottonseed, accounting (on the average) for about 55 per cent of the total value of all four products. About 90 per cent of all the cottonseed oil produced in the United States reaches the dinner table in one form or another. Before being used in food, crude cottonseed oil is refined. This involves treatment with a caustic soda solution, which combines with the free fatty acids in the oil and also absorbs foreign matter and some of the coloring. The mixture of caustic soda and other materials, known as foots or soapstock is separated out by gravity or (more commonly) by centrifuges, leaving what is known as refined oil. The soapstock is used in a number of inedible products, including soap, washing powder, paint, composition roofing.

The refined oil is put through a number of further processing steps, depending upon the type of finished product in which it is to be used. For the manufacture of shortening, margarine, and light-colored oils, cottonseed oil is bleached. If the oil is to be packaged as salad oil, it is winterized. This is a chilling process, which causes the stearin fraction of the oil to solidify. This is separated from the liquid fraction, leaving an oil that is clear even at low temperatures. Oil which is to be used in shortening or margarine must be changed from a liquid to a solid. This is accomplished by the process of hydrogenation, in which pure hydrogen gas is pumped into the oil at a temperature of 212°-215°F. The process may be controlled to produce oils of varying melting points and other characteristics. The last step in processing cottonseed oil, prior to the production of finished products, is deodorization. Both winterized oil, prepared for salad oil and cooking oil, and hydrogenated oil, prepared for shortening and margarine, have characteristic odors and flavors. These are vaporized by exposing the oil to superheated steam at high temperatures.

Historically the most important single use of cottonseed oil has been the manufacture of shortening. There are two general types of

shortening, known in the trade as standard and hydrogenated. Actually hydrogenation is employed to produce both types. For standard shortening a portion of the oil to be used is completely hydrogenated. This converts it to a very hard fat, which then is mixed with a quantity of liquid oil to obtain the melting point and the consistency desired in the finished product. In producing hydrogenated shortening all of the oil is subjected to partial hydrogenation, but the process is carried only far enough to bring the oil to the consistency and the melting point desired in the finished product.

Standard shortening is somewhat less expensive to produce than hydrogenated shortening and sells at a lower price. The latter has superior keeping qualities.

Another important product of cottonseed oil is margarine. In some years more cottonseed oil has been used in margarine than in any other single product. In the manufacture of margarine cottonseed oil is hardened, as in the preparation of hydrogenated shortening, but to a different consistency and melting point. It is then blended with pasteurized skim milk. Salt, vitamins A and D and several minor ingredients are added and the mixture is chilled. The result is a wholesome tablespread similar to butter. Sale of this product has been limited for many years by state and federal restrictions and taxes. However, federal taxes were repealed as of July 1, 1950, and a number of states have also repealed their restrictions upon the product. Production has been increasing since 1940 and the removal of these taxes and other restrictions, it is believed in the trade, will result in a further substantial increase.

Besides shortening and margarine large quantities of cottonseed oil reach the market as salad and cooking oil, salad dressing, and mayonnaise. Some oil also is used as a preservative, especially in canning fish.

Cake or Meal.—Cottonseed cake or meal is a protein concentrate used principally in the feeding of livestock. Most of the farm grains and roughages are deficient in the protein necessary for animal maintenance, growth, and development. The protein concentrates, such as cottonseed cake or meal, provide the means for overcoming this deficiency and also conserve the available supplies of grains and roughages. For example, where cottonseed meal is used only to the extent necessary to balance the ration, 100 pounds of meal will save 250-300 pounds of corn or other grains. Cottonseed meal may be fed without limitation to dairy cattle, beef cattle, horses, mules, and sheep. Because of the peculiar requirements of hogs and laying hens, feeding authorities recommend a mixture of animal and vegetable proteins with cottonseed meal limited to about 9 per cent of the ration for hogs and about 6 per cent for laying hens.

Cottonseed meal is used also to a limited extent as a fertilizer. It is rich in nitrogen and, in addition, furnishes phosphoric acid, potash, and small amounts of minor plant food elements. Being an organic, its plant food elements are released in the soil more slowly than those of the inorganic fertilizers. Meal is suited especially for fertilizing wrapper tobacco, truck, orchard and nursery crops, and lawns.

In general, however, it is more advantageous to feed cottonseed meal to livestock and to apply the animal wastes to the soil. In this way 65

to 85 per cent of the plant food elements contained in the meal can be returned to the soil. Since most of the nutrients removed from the soil when cotton is harvested are contained in the kernel of the seed, the combination of cotton production and livestock is one of the most effective systems for maintaining fertility of the soil.

While cottonseed cake or meal is used principally as an animal or plant food, it also has demonstrated its value as a human food. Prepared from a specially processed cake, a cottonseed flour rich in protein and vitamin B and practically free of starch is produced. Cottonseed flour is not generally available in retail stores, but is marketed principally in the form of bread, cake, cookies, and candies.

Hulls.—Cottonseed hulls are also used primarily as a livestock feed. They differ from cake or meal, however, in that they are a roughage rather than a protein concentrate. In feeding value they are comparable to good grass hay. They can be fed with less waste than hay and, throughout much of the cotton belt, are available at lower cost. Hulls make an excellent carrier for cottonseed meal and grain.

Several industrial uses for hulls also have been discovered. During World War II large quantities of hulls were used in the production of furfural. This is a selective solvent used extensively in the manufacture of synthetic rubber. It also is utilized in the refining of lubricating oils, the purifying of rosin, and the production of certain types of plastics. Hulls are used also to a limited extent in the manufacture of some phenol-type plastics. Generally, however, the demand for hulls for feed has dominated the market and has discouraged their widespread industrial use.

Linters.—Linters have a wider variety of uses than any of the other cottonseed products. The highest grades are spun for use in coarse products, such as twine, wicks, carpets, and gauze. A considerably greater quantity of linters is utilized in the bedding, automotive, and furniture industries, where linters serve as a filler for mattresses and comforts and for upholstery.

Since linters are composed principally of cellulose, this has made them an important raw material of the chemical industries. For chemical usage linters are first purified, a process which involves cooking with certain chemicals, bleaching, washing, and drying. The resulting linter pulp is practically pure cellulose, which is used in many products. In wartime most of the linter pulp is taken for production of smokeless powder. A bale of linters will furnish powder for 100,000 rounds of rifle ammunition, 20,440 rounds of machine-gun bullets, 2,700 anti-aircraft shells, or 85 rounds of heavy-tank ammunition.

The most important peacetime use of linter pulp is the manufacture of rayon. This synthetic fiber enters a wide variety of finished products, ranging from clothing and household items to tire cord and industrial fabrics. Linter pulp is also the basis for a number of the plastics used in such products as automotive and airplane instrument panels, lighting fixtures, radio cases, outdoor furniture, combs, pens, cigarette cases, and shoe heels. Photographic and X-ray film are processed from the same material, as are a group of tough, quick-drying cellulose lacquers.

JOHN F. MOLONEY,
National Cottonseed Products Association, Inc.,
Memphis, Tenn.

COTTONTAIL. See RABBIT.

COTTONWOOD, kōt'n-wōod, species of *Populus* trees belonging to the willow family (Salicaceae). There are two very common species in North America, *P. balsamifera* and *P. canadensis*. Besides these there are some 15 others, which occur under the names of poplar and aspen (qq.v.). *P. balsamifera* (balsam poplar or tacamahac) has an erect, pyramidal growth and is best planted in a group. The underside of the leaves is dull white. *P. canadensis* (balm of Gilead or Ontario poplar) has a spreading growth and is frequently used in street planting.

COTTONY-CUSHION SCALE. See SCALE INSECTS.

COTTRELL, kōt'rĕl, **Frederick Gardner**: American chemist and mineralogist: b. Oakland, Calif., Jan. 10, 1877; d. Berkeley, Calif., Nov. 16, 1948. Educated at the University of California, where he taught from 1902 to 1911, and at the universities of Berlin and Leipzig, he joined the U.S. Bureau of Mines in 1911, becoming its director in 1920. He was with the U.S. Department of Agriculture from 1922 until 1927 as director of the Fixed Nitrogen Research Laboratory, and thereafter served other governmental agencies, including the Tennessee Valley Authority, in important consultative and research activities.

Subsequent to his research in the field of electrostatic separation of suspensions, he invented the Cottrell electrical precipitator around 1910, which is used to recover such materials as potassium salts and arsenic from smelter flue dust waste (see also ARSENIC). He also conducted studies relating to the recovery of helium and to the liquefaction of gases.

COTYLEDONS, kōt-ĭ-lĕ'dŭns, the seed-leaves of the embryo plant, which serve it as organs of nutrition until the young vegetable is established in the soil and develops its true leaves. In flowering plants there are two kinds of embryos—one in which there is only a single cotyledon, and the other in which there are two cotyledons. This difference, being associated with several others of an important character, serves as the basis for the primary division of phanerogamic, or, more accurately, of angiospermous plants into monocotyledons and dicotyledons. The lower class of plants producing spores or cellular embryos having no cotyledons are called acotyledonous. On germination the cotyledons either serve as foliage-leaves or remain underground as fleshy lobes.

COTYLOSAURIA, kōt-ĭ-lō-sō'rĭ-ā, the most ancient of reptiles, from which, as is claimed by the American naturalist, Edward Drinker Cope and his adherents, sprang the saurian and snakelike species of later ages. Their remains are among the characteristic fossils of the Carboniferous and Permian ages. See also REPTILES.

COUCAL, kōō'kāl, or **LARK-HEELED CUCKOO** (*Centropus*), a genus of common bush-birds in Africa, India and through the Malayan Archipelago to Australia. The hind toe is prolonged into a very long spur. The 35 known species constitute the subfamily Cen-

tropoainae of the cuckoo family (Cuculidae). One species is held in religious veneration in Madagascar.

COUCH. See **QUILLER-COUCH**, ARTHUR THOMAS.

COUCH, Darius Nash, American soldier: b. Southeast, Putnam County, N. Y., July 23, 1822; d. Norwalk, Conn., Feb. 12, 1897. He was graduated at West Point 1846, served in the Mexican and Seminole wars, and resigned from the army in 1855 to engage in business. During the Civil War he was commissioned brigadier-general 1861; commanded a division in the battles of Williamsburg, Fair Oaks, and Malvern Hill; and commissioned major general July 1861. At Fredericksburg and Chancellorsville he commanded the Second Army Corps, organized the Pennsylvania militia to resist Lee's invasion 1863, and took part in the battle of Nashville and the North Carolina operations 1864-1865. In 1865 he was unsuccessful as the Democratic candidate for governor of Massachusetts; and was collector of the port of Boston 1866-1867. He moved to Connecticut soon after, and was adjutant general of that state, 1883-1884.

COUCH GRASS, kouch, a variation of quitch-grass, a perennial grass (*Agropyron repens*) and one of the most common and troublesome weeds of agriculture. When it first appears above ground its blade is readily eaten by sheep. In arable land, under any tolerable management, the seeds are never allowed to ripen, and the propagation is effected by the numerous joints of the long trailing rootstock, each joint sending forth a shoot which becomes a new plant. The proper time for extirpating it is in summer, when the land is undergoing a pure fallow, or, where fallow is not used, when the land is being prepared for a root crop. The rootstock may be used as food for various domestic animals.

COUCY, kōō-sē', CHATELAIN DE, French chevalier; hero of a tragic story often celebrated in ancient ballads and songs, sometimes in connection with other names than his. He became Châtelain of Coucy in 1186, took part in the Third Crusade (1189-1191) and was killed by the Saracens about 1203. His work consists of about 26 songs, in the troubadour style. They were published by Fritz Fath as *Die Lieder des Castellan von Coucy* (Heidelberg 1883).

In a fictitious legend, he was in love with Gabrielle de Vergy, lady of Aubert de Fayel, and dying in the Holy Land, he directed his faithful squire to enclose his heart in a casket and carry it to the Lady of Fayel. He was surprised by the lord of the castle, who found out on what mission he came. Burning with rage, and determined on revenge he ordered the heart to be served at table. The unhappy woman, having eaten, was told the nature of this horrible meal, whereupon she refused all sustenance, and died of voluntary starvation. Uhland has made this story the subject of a fine ballad. The story was first told in verse by Jakemon Sakesep at the end of the 13th century. There is a modern version by Crapelet (Paris 1829, 1895).

COUCY-LE-CHATEAU-AUFFRIQUE, kōō-sē' shā-tō-ō-frēk', commune, France, in the

department of Aisne; 18 miles west-southwest of Laon and 10 miles north of Soissons. Medieval gateways and part of the 13th century walls have been retained. During World War I, the Germans blasted the magnificent castle which had been famous for its robber barons of the 12th century. Industries include flour milling and sugar refining. Coucy gave its name to the famous lords of Coucy. Pop. (1946) 757.

COUDER, kōō-dâr', Louis Charles Auguste, French painter: b. Paris, April 1, 1790; d. there, July 21, 1873. He studied in Paris under de Regnault, David, and later in Munich. Among his works are *Caesar on the Ides of March*; *The Battle of Lawfeld*; *The Opening of the States-General, 1789*; and *The Siege of Yorktown*; the last three are at Versailles. In 1820, he decorated the rotunda of the Louvre with frescoes which were unsuccessful. His decorations of several Parisian churches and his later pictures are decided improvements. As a member of the conseil supérieur at the Ecole des Beaux-Arts he wrote some critical works on art.

COUDERSPORT, kou'dēr-z-pōrt, borough, resort, Pennsylvania. Potter County seat; altitude 1,650 feet; on the Allegheny River; 36 miles east-southeast of Bradford; on the Coudersport and Port Allegany Railroad. It is a mountain resort, in a farming area, producing potatoes and dairy products. The town has a tannery, and industries include the manufacture of toys, surgical appliances, tanning compounds, and silk. The surrounding country offers excellent hunting and fishing. Platted in 1807, the borough was incorporated in 1848. Pop. (1950) 3,210.

COUDERT, kōō-dâr', Frederic René, American lawyer: b. New York, Mar. 1, 1832; d. Washington, D.C., Dec. 20, 1903. He was graduated at Columbia College in 1850, and admitted to the New York bar in 1853. In 1877 he was a delegate of the New York Chamber of Commerce to the Antwerp Congress, which was held for the purpose of establishing a universal system of general average. In 1892 he was appointed one of the counsel on the part of the United States before the Bering Sea Tribunal of Arbitration in Paris, and was specially complimented for his argument on the necessity of putting a stop to pelagic sealing. On Jan. 1, 1896, President Cleveland appointed him a member of the Venezuela Boundary Commission. He was an authority on international law and several times declined appointment to the United States Supreme Court. He was legal representative of France in the United States. He received the cross of the Legion of Honor and decorations from Italy and Venezuela. He wrote *Addresses: Historical-Political-Sociological* (1905).

COUE, kwā, Emile. French psychotherapist: b. Troyes, France Feb. 26 1857; d. Nancy, July 2, 1926. He became famous for his formula "Every day in every way, I am growing better and better." He was a chemist from 1882 to 1910 and a student of hypnotism and suggestion, thereafter establishing a free clinic at Nancy. He taught in Europe and the United States. He emphasized the power of the imagination in the healing of disease and claimed that by this means he could teach people self-healing even to the extent of effecting organic changes.

COUES, kouz, **Elliot**, American naturalist: b. Portsmouth, N. H., Sept. 9, 1842; d. Baltimore, Md., Dec. 25, 1899. Coues' family moved in 1853 to Washington, D.C., where he was educated at Gonzaga Seminary and Columbian University, now George Washington University (A.B. 1861; M.D. 1863; Ph.D. 1869). After the outbreak of the Civil War, he enlisted in the United States Army as a medical cadet and in 1864 was appointed assistant surgeon. During the 17 years of his army service, Coues took every opportunity to cultivate his boyhood interest in birds, making collections and discoveries of new species in the locale of his various assignments, Fort Whipple, Ariz. (1864), Fort Macon, N. C. (1867-1870), and Fort Randall, Dakota (1873). He published his famous *Key to North American Birds* in 1872 and from 1873 to 1876 served as naturalist and secretary of the United States Boundary Commission. Subsequently he wrote *Birds of the Northwest* (1874) and *Birds of the Colorado Valley* (1878), and shared in the preparation of *Check List of North American Birds* (1886). In 1880 he became secretary and naturalist of the Geological and Geographic Survey of the Territories, for whose bulletins he wrote many ornithological papers. He was also one of the founders of the American Ornithological Union and assisted in the editing of its publications.

In addition to his important work in ornithology, Coues wrote *Fur Bearing Animals* (1877); taught anatomy at Columbian University (1877-1886); contributed to the *Century Dictionary*; and edited several works on early western travel, the best-known being *History of the Expedition of Lewis and Clark* (1893). For a brief period (1884-1889) he became interested in psychical research and was active in the Theosophical Society, until violent disagreements led to his expulsion in 1889.

COUGAR, kōō'gēr, a large American cat, generally known as Puma (q.v.).

COUGHLIN, kōg'l'n, **Charles Edward**, American Roman Catholic priest: b. Hamilton, Ont., Oct. 25, 1891. Father Coughlin was ordained in 1916 and 10 years later was sent to Royal Oak, Mich., as pastor of the Shrine of the Little Flower, where, in 1930, he began his rise to national prominence by organizing the Radio League of the Little Flower, through which he broadcast sermons heavily laden with political content. Originally a supporter of the New Deal, he took a violently anti-Roosevelt stand before the 1936 presidential election and organized the National Union for Social Justice, which supported its own candidate, Senator William Lemke. Thereafter he continued voicing his anti-Communist and anti-Semitic opinions, considered by many to be demagogic and fascistic, through his radio broadcasts and his own magazine, *Social Justice*. In 1942, the former were prohibited by his ecclesiastical superiors and the latter was barred from the mails under the espionage law.

COUIY. See **TREE PORCUPINE**.

COULANGES, Numa Denis Fustel de. See **FUSTEL DE COULANGES, NUMA DENIS**.

COULANGES, kōō-lānz'h', **MARQUIS Pierre Philippe Emanuel**, French poet and letter writer: b. Paris, Aug. 24, 1633; d. there, Jan. 31, 1716.

A cousin of Madame de Sévigné, Coulanges is best known as one of the correspondents in the famous *Lettres de Madame de Sévigné*. He served first as counselor and then as master of requests in the French parliament, but gave up public service to travel and to live leisurely in the elegant society of his time. He was a frequent visitor of such prominent women as Madame de Louvois, Madame de Maintenon, the duchess of Richelieu, and many others. He wrote a number of spirited and graceful songs published in *Recueil de Chansons* (1698), as well as letters and his memoirs, the latter of which were published in 1820.

His wife, **MARIE ANGELOUQUE DU GUÉ** (1641-1723), wrote about 50 letters, which rival those of Madame de Sévigné in their richness of spirit and knowledge of the world.

COULOMB, kōō-lōn, **Charles Augustin de**, French scientist and inventor: b. Angoulême, France, June 14, 1736; d. Paris, Aug. 23, 1806. The author of important studies in magnetism, electrostatics, and friction, Coulomb is best known for his invention of the torsion balance and his formulation of principles for measuring the force of magnetic and electrical attraction (see **COULOMB'S LAW**). In early life he entered the engineers' corps and served for some time in the West Indies. His treatise, *Théorie des machines simples*, dealing with the subject of friction in machinery, was published in 1779.

Coulomb became a member of the French Academy in 1781 and three years later was appointed superintendent of the waters and fountains of France. During the first part of the Revolution he retired from public activity to devote himself to research, but later took part in the new government's project of a metric system of weights and measures and in 1802 was appointed inspector of public instruction. See also **COULOMB**.

COULOMB, the unit of quantity in measuring electric currents. It is the quantity produced by a current of one ampere in one second. It was named for its discoverer, Charles Coulomb (q.v.) by the International Congress of Electricians in 1884.

COULOMB'S LAW, in physics, the law of interaction between two electric charges or two magnetic poles, demonstrated by Charles Augustin de Coulomb (q.v.). This law, which is similar to Newton's law of gravitation for the interaction between portions of matter, states that the force exerted between two electric or magnetic charges is directly proportional to the product of the charges, and inversely proportional to the square of the distance between them.

COULOMETER, kōō-lōm'ê-tēr (sometimes called a **VOLTAMETER**, vōl-tām'ê-tēr), a term applied to a device designed for measuring, by electrochemical means, the quantity of electricity in coulombs passing through an electrical circuit. Actually it measures the amount of electrolysis produced by the current in the electrolytic cell. The so-called "silver coulometer" has the largest acceptance among scientific laboratories. It was formally adopted by the International Electrical Congress, held in Chicago in 1893, as the most dependable of all the coulometers for the official measure of the efficiency of

an electrical current, the international ampere. For the construction of such a cell, consult Rosa, E. B., and Vinal, G. W., *Bulletin*, Bureau of Standards. vol. 13, p. 479 (Washington, D.C., 1916).

COULOMMIERS, kōō-lō-myā', town, France, in the department of Seine-et-Marne, 14 miles southeast of Meaux. It is situated on the Grand Morin River in an agricultural region yielding fruits, flowers, and dairy products. Coulommiers is famous for the manufacture of its Brie cheeses; other industries include sugar milling and metal processing. The old Church of St. Denis, whose choir and apse date from the 13th century and whose nave dates from the 16th century; the ruins of an early 17th century castle; and the birthplace of the French painter Jean de Boullongne, called le Valentin (1591-1634), are places of interest in the town. Coulommiers was damaged during World War I, but escaped bombing in World War II. Pop. (1946) 6,302.

COULTER, kōl'tēr, **Ellis Merton**, American historian and educator: b. near Hickory, Catawba County, N. C., July 20, 1890. After graduating from the University of North Carolina (1913), he received his master's degree (1915) and doctorate (1917) from the University of Wisconsin, where he also taught history. His career as an educator, begun as a high-school superintendent at Glen Alpine, N. C., was continued in teaching positions at Marietta College, Ohio, and at the University of Georgia, where he was appointed full professor in 1923. His publications on the old South, the American Civil War, and the period of reconstruction have been important contributions to the historical literature of the southern United States. He wrote *The Civil War and Readjustment in Kentucky* (1926); *College Life in the Old South* (1928; rev. ed. 1951); *A Short History of Georgia* (1933; rev. ed. 1947); *John Jacobus Flournoy, Champion of the Common Man in the Antebellum South* (1943); *The South During Reconstruction 1865-1877* (1947); and *Confederate States of America, 1861-1865* (1950).

COULTER, kōl'tēr, **Ernest Kent**, American lawyer and humanitarian: b. Columbus, Ohio, Nov. 14, 1871; d. Santa Barbara, Calif., May 1, 1952. Coulter was educated at Ohio State University (B.A. 1893) and at New York Law School (LL.B. 1904) and thereafter practiced law in New York, where he founded the Big Brother Movement (q.v.), a group of volunteer workers to aid in the rehabilitation of delinquent boys. He was also an organizer of the Children's Court of New York (1902-1912) and general manager of the New York Society for the Prevention of Cruelty to Children (1914-1936). He was the author of *The Children in the Shadow* (1913), which he describes as "the story of three delinquents, the child, the parent, and the community, as it comes from the new but greatest social clinics in the world, the Children's Courts."

COULTER, John Lee, American economist and statistician: b. Mallory, Minn., April 16, 1881. Educated at the University of North Dakota (B.A. 1904; M.A. 1905; LL.D. 1922) and at the University of Wisconsin (Ph.D. 1908), Coulter was an instructor successively from 1907

to 1909 at Iowa State College, the University of Wisconsin, and the University of Minnesota, where he also served for two years as assistant professor of rural economics. From 1921 to 1929 he was president of the North Dakota Agricultural and Mechanical College. Coulter's chief contribution was his service as special agent of the United States Census Bureau (1910-1912) and as chief economist and chairman of the advisory board of the United States Tariff Commission (1929), on which he served as a member until 1934. He was the author of *Economic History of the Red River Valley of the North* (1910); *Cooperation Among Farmers* (1911); and *Postwar Fiscal Problems and Policies* (1945).

COULTER, John Merle, American naturalist: b. Ningpo, China, Nov. 20, 1851; d. Yonkers, N. Y., Dec. 23, 1928. A graduate of Hanover College, Ind. (B.A. 1870; M.A. 1873), Coulter was employed by the United States Geological Survey (1872-1873) as a botanist in the Rocky Mountains and subsequently as professor of natural science at Hanover (1874-1879). At Wabash College, Ind., where he received his doctorate (1884), he was professor of biology from 1879 to 1891. In the latter year, Coulter was named president of Indiana University and also professor of botany there. In 1893 he became president of Lake Forest University and three years later moved to the University of Chicago as professor of botany and head of the botany department. From 1895 until his death he was connected with the Boyce Thompson Institute of Plant Research at Yonkers.

One of the outstanding American botanists of his generation, Coulter served as president of the American Association for the Advancement of Science in 1918 and was a member of the National Research Council from 1923. For many years he edited the *Botanical Gazette*, which he helped to found in 1875. Among his publications were *Manual of Rocky Mountain Botany* (1885); *Manual of Texas Botany* (1891); *Plant Relations* (1899); *Plant Structures* (1899); *Plant Studies* (1902); *A Textbook of Botany* (1906); *Elementary Studies in Botany* (1913); *Evolution of Sex in Plants* (1914); *Fundamentals of Plant Breeding* (1914); and *Plant Genetics* (1918). He also edited the 6th edition (1890) of Gray's *Manual of Botany* and, in collaboration with Charles J. Chamberlain, wrote *Morphology of Gymnosperms* (1901) and *Morphology of Angiosperms* (1903).

His brother, **STANLEY COULTER** (b. Ningpo, China, June 2, 1853; d. Lafayette, Ind., June 26, 1943), was professor of biology and director of the biological laboratory at Purdue University (1887-1926), where he also served as dean of the school of science (1907-1926) and dean of men (1919-1926). His publications include *Forest Trees of Indiana* (1892); *Flora of Indiana* (1899); and *A Key to the Genera of the Native Forest Trees and Shrubs of Indiana* (1907).

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COUMARIN (also CUMARIN), kōō'mā-rin, a chemical substance used as a fixative in perfumery (see PERFUMES AND PERFUMERY—*Ingredients and Extraction Processes*). It has the formula $C_9H_6O_2$, and is prepared in the form of crystals, flakes, or powder. The finer grades

are derived from the Tonka bean, but it is also obtained by heating salicylic aldehyde, sodium acetate, and acetic anhydride. It was banned in the United States as a food flavor in 1953.

COUMARONE, kōō-má-rōn (also CUMARONE, or BENZOFURAN), a substance derived from coal tar, which is used in making synthetic resins. It is a colorless liquid, soluble in alcohol or ether but insoluble in water, and has the formula C_8H_6CHO .

COUNCIL (Lat. *concilium*), an assembly met for deliberation, or to give advice. The term as used in an ecclesiastical sense specially applies to certain assemblies of the Roman Catholic Church. These may be classed as ecumenical, provincial or patriarchal councils and synods; but the last is not usually included among councils. An ecumenical or general council is one in which the bishops and others entitled to vote are convoked from the whole world to deliberate on the state of the Church or to meet an emergency, as the rise of a new heresy. The decrees of such a council, having received papal confirmation, are binding. A council might be ecumenical in its convocation, yet if its decrees did not receive the papal confirmation they would not be binding, and the council would not be considered of ecumenical authority. Or a council might not be ecumenical in its convocation, but its decrees being accepted and receiving the papal confirmation, it is then classed as ecumenical. The First Council of Constantinople was originally a council of the East, but ultimately its decrees on faith were accepted in the West and received the confirmation of the Pope. Patriarchal councils represent a whole patriarchate; national councils, a nation; and primate councils, provinces subject to a primate. (See PATRIARCHS). Provincial councils are of a province and are known usually by the name of the metropolitan see. (See METROPOLITAN). Diocesan councils, usually termed synods, are composed of the clergy of the diocese and are presided over by the bishop or vicar-general or a representative of the bishop.

Ecumenical councils are convoked by the Pope, and are under his presidency or that of his legate. In the early ages of Christianity councils were sometimes convoked by emperors, but only by permission or by request of the Pope. The dangers and difficulties of traveling in those times made it necessary to have the protection of the civil powers, and hence the real part which the emperor took in convoking the council was to promise it immunity from those who might wish to influence or retard its deliberations. The patriarch, metropolitan or bishop convokes the council within his jurisdiction. The membership of councils not ecumenical consists of the local clergy, as in a diocese, or the suffragan bishops of a province or patriarchate. Certain rules regulating representation are observed. In the early ages (and even as late as 1598), laymen were sometimes invited to attend provincial councils. They were permitted to present complaints and give advice but it is very doubtful if they ever took any part in the voting. In two instances at least women attended. (See HILDA, SAINT). Ecumenical councils are composed of patriarchs, archbishops and bishops and such

other ecclesiastics as may be invited for specified reasons, as theologians, one at least for each archbishop or bishop. (The Council of Trent gave procurators—priests and deacons—of absent bishops a right to vote. The Vatican council did not even admit to the council hall such procurators). In matters of faith the Holy Scriptures and the traditions of the Church are the guide, while in lighter matters human reason and expediency are consulted. In the former, ecumenical councils are held to be infallible, but in other matters of discipline, etc., the latest council decides questions. Cardinals, even if not bishops or abbots, generals of regular orders, mitred abbots of whole orders, may be members with right to vote. The rule has always prevailed that no royal representative may be present at any council except a general one in which "faith, reformation and peace" are in question.

The presidency of a council does not confer an ex officio right to vote or to take part in the deliberations, such right depending upon the hierarchical rank of the one presiding.

Usually bishops take their places according to the rank of their sees. At the Vatican council they were arranged according to their hierarchical rank,—first the Pope, then the cardinals, patriarchs, primates, archbishops, bishops, abbots and generals of orders. The voting is generally by single vote, but at Constance the vote was by nations. At Basel the members were divided into four deputations which met separately. Decrees passed by three deputations were accepted by all. At Trent much of the matter to be debated was first considered by commissions. (See COUNTER-REFORMATION). The proceedings of the Vatican council, not yet finished, were conducted in a somewhat similar manner.

Church historians usually regard the assembly of the apostles in Jerusalem described in the Acts of the Apostles as the first example of a general council of the Church; yet that assembly is not entered in the list of the 20 general councils. From the times immediately subsequent to the epoch of the apostles, the fathers always on occasion of controversy over questions of faith or of discipline appeal to the tradition of the apostolic doctrine and government as preserved in the churches founded by the several apostles or authentically derived thence, to the churches scattered over the world. Not till peace was assured to the Christian body by Constantine was it deemed prudent to hold a general assembly of the Church's pastors, the bishops; though in various provinces of the empire—in Gaul and Spain, in Mesopotamia, in Africa, synods or councils were held even in the times of persecution. But in the year 325 there assembled at Nicaea in Bithynia, at the call of the emperor, the first or Nicene council. As this council and many which followed were in their membership predominantly Eastern, so in later councils Western bishops predominated; and for some time the decrees of these predominantly Eastern, or predominantly Western, councils were not accepted by both sections; but in time many of them received a tacit acceptance as expressing the teaching of the whole Church Catholic; while the decrees of other Eastern and other Western churches are ignored on one side or the other.

The general or ecumenical councils of the

Church, as reckoned by Roman Catholic historians, are as follows:

	A.D.
1. Council of Nice (<i>Nicaea</i>)	325
2. First Council of Constantinople	381
3. Council of Ephesus	431
4. Council of Chalcedon	451
5. Second Council of Constantinople	553
6. Third Council of Constantinople	680
7. Second Council of Nice	787
8. Fourth Council of Constantinople	869
9. First Council of Lateran	1123
10. Second Council of Lateran	1139
11. Third Council of Lateran	1179
12. Fourth Council of Lateran	1215
13. First Council of Lyons	1245
14. Second Council of Lyons	1274
15. Council of Vienne	1311-1313
16. Council of Constance	1414-1418
17. Council of Basel	1431-1438
Council of Basel continued in Council of Ferrara-Florence	1438-1442
18. Fifth Council of Lateran	1512-1517
19. Council of Trent	1545-1563
20. Council of the Vatican (not finished)	1869

Of these councils the Greek Church acknowledges the first seven. See separate accounts of the different ecumenical councils.

Among religious bodies of the Protestant faith the word council is applied to assemblies lacking the authoritative form of the Roman Catholic councils. In the Baptist and Congregational denominations it is customary to use the term council in relation to gatherings called on matters of local or restricted interest or in connection with ordinations or other church functions. A national council in these denominations is advisory in its nature. The Pan-Presbyterian Alliance is in the nature of a council of churches following the Presbyterian form of organization and holding the Reformed faith. The Evangelical Alliance (q.v.) is broad and inclusive in its constituent elements and in the themes considered. In the systematic nature of their organizations and the authoritative character of their decisions the councils of the Roman Catholic Church are more nearly related to the permanent governing bodies of evangelical sects charged with the regulation of faith, order and discipline—such as the general and diocesan conventions of the Protestant Episcopal Church, the general assemblies and synods of the Presbyterian Church, and the general conferences of the Methodist Church.

In its use as a term relating to civil government, the word council signifies a body of men selected to advise a sovereign or other ruler. The body exercising such functions in Great Britain is known as the privy council (q.v.). In colonial times there existed in America councils modeled on the English privy council and originally intended as the executive bodies of the various provinces, in conferences with the respective governors. Such a body was called the executive council or legislative council, or simply the council. As the legislatures developed into the bicameral form in which we now know them, the upper house kept the name council until long after the Revolution; in South Carolina until 1790; in Delaware until 1792; in Georgia until 1798 and in Vermont until 1836. The territories have retained the name, and it is used in some states for a body like that in the old provinces, the executive council of the governor.

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COUNCIL BLUFFS, city, Iowa, and seat of Pottawattamie County, on the east bank of the Missouri, opposite Omaha, Nebraska, at an altitude of 984 feet, and served by the Union Pacific, the Chicago and North Western, the Wabash, the Chicago Rock Island and Pacific, the Missouri Pacific, the Illinois Central, the Chicago Great Western, and the Chicago, Milwaukee, St. Paul and Pacific railroads, and on four federal and two state highways.

The city is well laid out on a plain underlying high bluffs, and is connected with Omaha by Bridges over the Missouri. Transport lines connect it with Lake Manawa State Park, a beautiful summer resort three miles south of the city.

Industry.—Council Bluffs is one of the great agricultural implement trade centers of the world and manufactures as well tools, railroad equipment, batteries, truck bodies, machinery, elevators, livestock remedies, playground equipment, radio parts, canvas, feed, and soft drinks. It is a railroad terminus point and has railway repair and maintenance shops.

History.—The name of the city came from a council held 20 miles north of Omaha in 1804 between the Indians and the explorers Meriwether Lewis and William Clark. However, the city's name had once been changed from Hart's Bluff to Kanessville by the Mormons who early came to settle here. In April 1847 the Mormons were expelled from the city to become the pioneers of Utah, and in 1849 Kanessville was an important outfitting point for travelers to the California gold fields. The name was officially changed to Council Bluffs in 1852 and a year later the city was incorporated. In 1863 it became the terminus for the Union Pacific Railroad and there is a Golden Spike Monument here to commemorate the occasion. The city is governed by a city manager and council. Pop. (1950) 45,429.

COUNCIL GROVE, city, Kansas, seat of Morris County, at an altitude of 1,234 feet, situated on the Neosho River, 129 miles northwest of Parson, and served by the Missouri, Kansas and Texas, and the Missouri Pacific railroads. In a rich dairy, poultry, and grain region, it has a dairy and poultry products processing plant, flour mills, grain elevators, and machine shops.

An Indian treaty made here in 1825 permitted the survey of the Santa Fe Trail, to which the place owed its growth until 1866 when the railroad came through. Its Methodist Indian mission (built in 1849 and still standing) was the site of the first white school in Kansas. Another building, the Last Chance Store, built in 1857, still stands as a monument. Pop. (1950) 2,722.

COUNCIL OF BLOOD. See BLOOD, COUNCIL OF.

COUNCIL OF CONSTANCE. See CONSTANCE, COUNCIL OF.

COUNCIL OF FIVE HUNDRED. See DIRECTORY.

COUNCIL OF FLORENCE. See FERARA AND FLORENCE, COUNCILS OF.

COUNCIL OF FOREIGN MINISTERS. See PACTS AND CONFERENCES: WORLD WAR II.

COUNCIL OF FRANKFURT. See FRANKFURT, COUNCIL OF.

COUNCIL OF NATIONALITIES. See UNION OF SOVIET SOCIALIST REPUBLICS—*Government and Politics*.

COUNCIL OF TEN. See TEN, COUNCIL OF.

COUNCIL OF THE ELDERS. See DIRECTORY.

COUNCIL OF THE VATICAN. See VATICAN COUNCIL.

COUNCIL OF TRENT. See TRENT, COUNCIL OF.

COUNCIL OF WAR, an assembly of officers of high rank called to consult with the commander in chief of an army or admiral of a fleet on matters of supreme importance. The commandment of a garrison will accept or generally solicit the advice of such a council before surrendering to an enemy.

COUNCILL, William Hooper, Negro educator: b. Fayetteville, N. C., July 12, 1848; d. Normal, Ala., 1909. Born a slave on a North Carolina plantation, he received after the Civil War three years of education in a school in Stevenson, Ala. (1865-1867) and held the positions of chief enrolling clerk in the Alabama House of Representatives (1872-1874), and receiver general in the land office of the Northern District, Alabama (1875). He was the organizer and the first president of the Agricultural and Mechanical College (now the Alabama A. and M. College), at Normal, Ala. He was the founder and editor of the Huntsville *Herald* from 1877 to 1884 and became a member of the Supreme Court of Alabama in 1883.

COUNCILMAN, William Thomas, American physician: b. Pikesville, Md., Jan. 1, 1854; d. May 26, 1933. He was educated at the University of Maryland, and at Vienna and Leipzig, was for some time associate professor of pathology in Johns Hopkins University, and became Shattuck professor of pathological anatomy at Harvard University in 1892. He devoted much study to smallpox, and announced his discovery of the probable etiology of smallpox. He published monographs on dysentery, cerebrospinal meningitis, diphtheria, and smallpox.

COUNCILORS, City. See CITY COUNCILS, AMERICAN.

COUNCILS, Lateran. See LATERAN COUNCILS.

COUNCILS OF CONSTANTINOPLE. See CONSTANTINOPLE, COUNCILS OF.

COUNCILS OF JERUSALEM. See JERUSALEM, COUNCILS OF.

COUNCILS OF LYONS. See LYONS, COUNCILS OF.

COUNCILS OF NICAIA. See NICAIA, COUNCILS OF.

COUNSEL, the advice given as to a proposed line of conduct, claim, or contention; also a legal practitioner. In a narrower sense, the term is sometimes used to describe a lawyer who specializes in giving advice on the preparation and management of lawsuits, and in appearing in court to conduct trials, argue cases, or present motions. In this usage, "counsel" is more restricted than "attorney at law" (q.v.), since the latter includes anyone who engages in any of the branches of the practice of law, whether or not he appears in court or engages in the preparation of cases. A distinction was formerly made, in common terminology, between "counsel" and "attorney at law," analogous to the British distinction between "barrister" and "solicitor." At the present time, however, there is no practical distinction between the two terms in the United States.

COUNSELOR AT LAW. See ATTORNEY AT LAW.

COUNT, a title of dignity, derived from the Latin *comes*, literally, companion. Historically, in the early Roman Empire, the word *comes* meant simply attendant. Later, as the emperors surrounded themselves with many *comites*, they gained power through official duties. Under Hadrian they formed a permanent council, and the designation *comes* became a formal official title. During the reign of Constantine, 10 out of 35 provincial generals received the title of *comes*. After the fall of the Roman Empire the title was retained by the conquerors; later under Charlemagne it denoted equally military or civil employment.

After the Franks became the ruling nation, the king made appointments with jurisdiction over certain districts which carried the title of *Grafen*. The German title *Graf* corresponds to the title "count" and the office of *grafio* was often designated by the Latin *comes*. In France the count of the palace (*comes palatii*) had, by the 11th century, acquired rank apart from that of the other counts. The title has never been used in England although its Latin equivalent has been the common translation for "earl," and the wife of an earl has always been designated a "countess."

Under the Carolingian kings of France the institution of countship was maintained and strengthened; but the feudal evolution changed the status of counts from representatives of royalty clothed with military, political, judicial and financial responsibilities to hereditary lords who were vassals of the king and no longer functioned as his representatives. In medieval and Renaissance times the importance of the title varied. Some counts, like those of Flanders and Champagne, enjoyed greater prestige and power than most marquises and dukes, while others were little more than country squires. This title, with all other nobiliary and royal titles, was suppressed by Revolutionary France but reappeared under the Empire. In present-day Republican France

many individuals having the hereditary right to call themselves counts and countesses ignore their titles. In general it may be said that in France whatever social prestige attaches to a title depends on the luster of the family tradition, not on the title.

Since medieval times Italy has been able to boast a greater number of counts than any other region of Europe, due to the fact that popes and princes granted the title of *conte* indiscriminately. There being no strict rule of primogeniture or regulating authority for titles, the number of such *conti* has always included many persons having no legitimate right to any title. The papal title is still given as a reward for services to the Roman Catholic Church. In Italy, whatever social value exists in a countship, as in France, depends on the eminence of a family tradition, not on its title. The Spanish title of *conde*, however, carries considerable prestige, because the law of primogeniture is strictly observed and the government exacts a fee on the inheritance of a title. Like other Spanish titles, that of *conde* may be transmitted through the female line. See also TITLES.

COUNT OF MONTE CRISTO, The.

A typical novel of the romantic period in France was *The Count of Monte Cristo*, by Alexandre Dumas, written from 1841 to 1844 with the assistance of two minor collaborators, Auguste Maquet and P. A. Fiorentino. It was begun before and completed after the equally famous *Three Musketeers*, from which it differs in being more melodramatic and intense, less natural and humorous. The protagonist, Edmond Dantès, bears the earmarks of the romantic hero of the Byronic poems, although he is not so sentimental, being endowed with an active passion that sets him wrestling with superhuman difficulties instead of brooding over them in sick despair. Dantès is the victim of unscrupulous enemies, a gloomy giant outraged by society. Unjustly confined within the dungeons of the Château d'If, he learns from a fellow prisoner the arts and sciences, and the secret of a buried treasure. When his companion dies, Dantès, assuming the rôle of the corpse, is flung into the sea and swims to freedom. He recovers the lost treasure, and, as the possessor of immense wealth, proceeds to work out his elaborate schemes for mysteriously rewarding those who have been his benefactors, and wreaking vengeance upon those who are responsible for his misfortunes. He is ruthless in his pursuit of these enemies, insinuating himself unsuspected into their good graces, and leading them on by diverse paths to destruction.

COUNT ROBERT OF PARIS, a novel by Sir Walter Scott (q.v.), first published in 1831, the year before his death. Together with *Castle Dangerous*, it was reissued the following year as the fourth series of *Tales of My Landlord*, the two works constituting the last productions from the author's pen. The story is set in Byzantium, at the court of Emperor Alexius Comnenus, during the time of the First Crusade (1096-1099). The leading characters in the novel are Count Robert; his wife Brenhilda; Hereward the Saxon; and Nicephorus Briennius (properly Bryennius), the emperor's son-in-law, who is engaged in a conspiracy to supplant the monarch. Godfrey of Bouillon and other leading Crusaders also appear.

COUNTER REFORMATION, the movement within the Roman Catholic Church to correct abuses, to raise the moral and spiritual level of both clergy and people, to improve administrative personnel and procedure, and, in view of existing needs, to make and put into effect an authoritative statement of belief and practice. Beginning in the second decade (1527-1537) of the Protestant Reformation, it lasted for more than a century. Both Reformation and Counter Reformation are unsatisfactory terms. The former names a definite break with the Catholic Church and the establishment of the new Lutheran, Calvinist, and Anglican systems, all differing essentially in doctrine, organization, and practice from the Catholic system, and in various ways from one another. The latter names a movement only secondarily directed against the Protestant bodies. Primarily it was a process taking place within the church: an inner purging of ills and a restoration to health and vigorous action.

In antecedents the two movements had certain things in common. For the Catholic reform, the principal events and conditions inducing its need include the following: the weakening of large sections of the clergy in education and character after the devastation wrought by the Black Death; faults and aberrations in some forms of popular devotion; corruption among some of belief and morals attendant on the pagan elements in the Renaissance; defects and abuses within the church's administrative departments; decline of loyalty to the Holy See; the emergence of the powerful secular state; decadence in the field of traditional theology and philosophy; and finally the urgent challenge of the Protestant triumph in much of northern Europe, together with its threat to make still further conquests.

The movement was chiefly under the leadership of a succession of outstanding popes, aided by a diversified group of great saints, such as Charles Borromeo and Ignatius Loyola, and various other religious and civil leaders. This multifaceted work of reform and revival had its beginnings in the brief reign of the Dutch Pope Adrian VI (1522-1523), only to be delayed by the disastrous pontificate of Clement VII (1523-1534). His successor, Paul III (1534-1549), immediately began plans for a general council of the church, but it was not until December 1545 that the first sessions of the 19th ecumenical council were held. For over 18 years, but with long interruptions, the epochal Council of Trent (q.v.) continued its work. Among doctrinal subjects upon which decrees were issued were those of Sacred Scripture, tradition, original sin, the Mass, and the sacraments; among disciplinary matters was legislation on clerical education, ecclesiastical benefices, and requirements for episcopal residence. Not the least of its effects was the issuance of the Roman Catechism, with a consequent improvement in religious instruction.

Seven popes continued the work begun by Paul III: Julius III (1550-1555), Marcellus II (1555), who as Cardinal Marcello Cervini degli Spannochi had taken a leading part at Trent, Paul IV (1555-1559), Pius IV (1559-1565), St. Pius V (1566-1572), Gregory XIII (1572-1585), and Sixtus V (1585-1590). Especially noteworthy were the changes made by Paul IV in the papal court. Under him and St. Pius V almost the last vestiges of what was most harmful in Renaissance thought and conduct were erased from the Roman curia.

The reform of old communities and the estab-

lishment of new orders were an important part of the movement. Among reformed communities the Capuchins, an autonomous Franciscan group, made great contributions by their preaching, charitable work, and missionary activities. In Spain, under the leadership of St. Theresa of Avila and St. John of the Cross, great as organizers and writers as well as mystics, the Carmelites began a remarkable revival. The Theatines were established in 1524 by St. Cajetan of Thiene and Giovanni Pietro Caraffa (the future Paul IV). In 1564 the Oratorians were founded by St. Philip Neri. Most famous and influential of all was the Society of Jesus. Established by St. Ignatius Loyola in 1540, the Jesuits soon became leaders in almost every field. St. Francis Xavier, St. Peter Canisius, St. Aloysius Gonzaga, St. Francis Borgia, St. Robert Bellarmine, James Lainez, Edmund Campion, and Robert Parsons (or Persons) are only a few of the outstanding figures in the society's first century.

The results of this immense surge of prayer and labor on the part of many-sided geniuses in both high and low places, the leadership which they offered, and the response given by great masses of the people appeared in various ways. The advance of the new religions was halted, especially in Poland and Germany; in other places, where the issue was still in doubt, the church at length prevailed. In England the Catholic forces were rallied and a foundation on which to preserve the faith among Catholics and to bring converts into the church was laid. Missionaries were sent into the New World and to the East. Not only was there moral reform, but also to devotion and spirituality were given a new direction and a sounder basis. In this last work two names are pre-eminent: St. Francis de Sales, with his *Introduction to the Devout Life*, and St. Ignatius Loyola, with his *Spiritual Exercises*.

So great a resurgence of life and vigor necessarily had its impact upon the arts. Masterpieces of later Renaissance and mannerist architecture; the glories of the baroque style, which has been likened to a mighty shout in praise of God; and the music of such men as Palestrina and Victoria can be understood only in this reference. Productions in painting and sculpture by El Greco, Tintoretto, Bernini, and countless others reflect the spirit of this era of strenuous faith. Literature too had its part, especially in Spain. Suarez, John of St. Thomas, Dominic Soto, Thomas Stapleton, and Bellarmine appear in philosophy and theology. Like the rise of Protestantism, the Catholic reform was crucial for the history of Europe and the world. As a great constructive effort, its effects have been so deep and pervasive that, despite vast changes which ensuing centuries have effected, they are still felt throughout the church and the world.

Consult Pastor, Ludwig von, *History of the Popes*, vols. 11-30 (St. Louis, Mo., 1912-40); Hughes, Philip, *Rome and the Counter-Reformation in England* (London 1942).

JOHN K. RYAN,
Professor of Philosophy, The Catholic University of America.

COUNTERATTACK. See MILITARY TERMS.

COUNTERBATTERY FIRE. See MILITARY TERMS.

COUNTERESPIONAGE. See ESPIONAGE.

COUNTERFEITERS. The (*LES FAUX-MONNAYEURS*), which first appeared in French in 1926, is the only one of André Gide's works he is willing to designate as a novel. Various called his masterpiece, a novelist's novel, and a distinguished failure, it is a complex fiction of over 500 pages embodying 28 characters. At least four principal themes are interwoven in a contrapuntal composition inspired by Bach, and borrowed in Aldous Huxley's *Point Counterpoint*: the counterfeit existence most people lead (more significant to the title than the youthful circulators of false coinage who figure in the plot); the decay of the middle-class family represented by those of the two judges, Profitendieu and Molinier, and the Protestant minister, Vedel; the conflict between the generations; and, finally, the creation of the work of art. By placing at the center of the action the novelist Edouard, who, much like his creator but without his genius, is trying to write the very novel we are reading, Gide throws extraordinary light upon all the themes. For Edouard is closely related to the Moliniers and has lived in the Vedels' boarding school; by age he belongs to the parents' group and by temperament and affection to that of the children. Deeply moved by his nephew, Olivier Molinier, he takes Bernard Profitendieu as his secretary; this is but one of the counterfeit substitutions.

Haunted by the technique of the story within a story, which he finds in *Hamlet*, in Poe's *Fall of the House of Usher*, and in Goethe's *Wilhelm Meister*, Gide here makes his best use of it. Edouard sees two centers to his novel: the event and the effort to make it into art, and this is precisely what Gide, himself, gives us. Hence his consistent use of what he calls indirection: events are related, ideas expressed, and characters described by the characters themselves in their conversations, journals, and letters. The reader, who consequently seems to know more than the author, must collaborate with him to reconstruct the truth. Gide, remaining aloof, is thus able to comment dispassionately upon action and characters as Fielding and Sterne have done. Such a technique, added to the novelist's refusal to take advantage in one chapter of the impetus accumulated in the preceding one, achieves the fascinating variety and confusion of life itself. Like the adolescent heroes who stand at its center, the novel indeed is in a state of becoming before our very eyes, and, despite the climatic episode of a schoolboy's suicide, it ends with the suggestion that it could be continued. Such a novel calls for most attentive reading, but has not Gide said that he writes to be reread?

A suicide and two unsuccessful attempts, a glorification of the bastard, and a sympathetic, natural presentation of uranism are sufficient to alienate moralistic readers. Indeed, even the Devil tiptoes incognito throughout the novel, occasionally appearing visibly to those who believe in him. For, like Dostoyevsky, on whom he gave a series of stimulating lectures while writing this novel, Gide enjoys challenging conventional morality and psychology. Early in his career he recognized that his function was to disturb and that none of his books would leave the reader intact.

JUSTIN O'BRIEN,
Professor of French, Columbia University.

COUNTERFEITING. The making of bogus currency, coins, or other obligations, and

in the broad sense, the fraudulent circulation of such—is one of the oldest of crimes against the sovereign state. The seriousness with which this offense against the people has been regarded throughout the ages is attested by the fact that at times in various lands it has been punishable by death.

History indicates that this crime of counterfeiting has existed almost from the time that a circulating medium of exchange was devised. History itself has been influenced in several instances when counterfeiting was engaged in on a large scale, or when it was instigated as a method of economic or actual warfare.

The still common expression «Not worth a Continental,» to denote worthlessness, dates back to the American Revolution when counterfeiting contributed to the devaluation of Continental currency. In 1789 the French Revolutionary government issued currency known as assignats. By 1796 the enemies of the revolution had circulated billions of francs in counterfeit assignats, and the currency became valueless. It subsequently was repudiated by the government.

In 1812 Napoleon Bonaparte, Emperor of France, is said to have purchased military supplies for his invasion of Russia with counterfeit money produced at a printing plant he established in Paris.

In the United States, the power to provide punishment for counterfeiting is vested in the Congress under Section 8 of the Constitution, and the federal agency charged with the suppression of counterfeiting is the United States Secret Service, a branch of the Treasury Department. (See SECRET SERVICE, UNITED STATES).

Prior to 1860 Congress had passed several laws with respect to counterfeiting, but had provided no funds for the enforcement of those laws because the paper currency in circulation was privately printed by individual banks in some 3,000 different designs, and there was no standard federal paper money. In 1860 an appropriation of \$10,000 was made for the purpose of detecting and bringing to trial persons engaged in the counterfeiting of coins.

An act of 25 Feb. 1862, authorized the issue of \$150,000,000 in United States notes, not bearing interest and payable to the bearer. They were legal tender for all debts except duties on imports and interest on the public debt, and were popularly referred to as «greenbacks.» The act of 3 June 1864, known as the National Bank Act, supplementing an original act of 25 Feb. 1863 (see BANKS AND BANKING—*The National Banking System*), is the basic act for the national banking system, and provided for the organization of national banks and the issuance of circulating notes. These notes were drawn on the various national banks, but were issued under government supervision on the strength of collateral furnished by the banks in the form of United States interest-bearing registered bonds. With the adoption of the federal currency in the form of United States notes and national bank notes, the private bank notes became obsolete and the government necessarily acted to protect the new money against counterfeiting. In 1864 the sum of \$100,000 was made available for the suppression of counterfeit currency and other forms of obligations of the United States.

During the period 1860 to 1865 the solicitor of the Treasury had supervised the operations of persons who furnished information on counterfeiting and had approved payments made to them. However, the new federal currency was counterfeited so extensively that it became necessary to make a definite and centralized effort to suppress these violations and to restore and maintain public confidence in the new money. Accordingly, on 5 July 1865, Hugh McCulloch, then Secretary of the Treasury, created the United States Secret Service, and this agency has since been responsible for the prevention and suppression of counterfeiting in the United States.

These first Secret Service agents, in addition to following traditional investigative methods, developed certain distinctive techniques designed to identify, arrest and convict counterfeiters, and to locate and destroy their plants. The service, one of the oldest federal law enforcement groups, makes full use of all the modern developments in scientific crime detection; and, in addition, beginning in 1937, pioneered a novel approach to prevention of crime through educational methods. The theory of this new method is that the passing of counterfeit money can be made too dangerous to be profitable by teaching handlers of money, including the general public, how to distinguish good money from bad. Special training has been brought to bank employes and other commercial handlers of cash, and an effective system for speedy dissemination to such agencies of warning notices and details of new counterfeits as they appear has been one phase of this program. In addition, under the slogan, «Know Your Money,» instruction in the detection of counterfeits has been carried to the general public through the schools, through motion pictures, radio, lectures, and newspaper and magazine articles.

The volume of counterfeit money circulated in the United States has fluctuated widely through the years. The peak appears to have been reached in the middle 1930's when several large gangs organized extensive operations from plants set up in the eastern part of the nation. Representative value of bogus bills and coins seized in several of these years exceeded \$1,000,000. The destruction by the Secret Service of these gangs, and the conviction and sentencing to long prison terms of scores of the bogus money circulators brought a substantial reduction in such losses to the public. The amount of spurious bills and coins seized has continued drastically downward in recent years, and the total for the fiscal year ended 30 June 1944, was only \$47,060. The Crime Prevention Program of the Secret Service, stringent enforcement efforts and other factors have contributed to this marked decline in the crime of counterfeiting.

It is not difficult to distinguish good money from bad. Genuine bills are printed from engraved steel plates produced by master craftsmen at the Bureau of Engraving and Printing in Washington, D.C. Most counterfeit bills, however, are printed from copper or zinc plates upon which the impressions of the bills have been etched with acid.

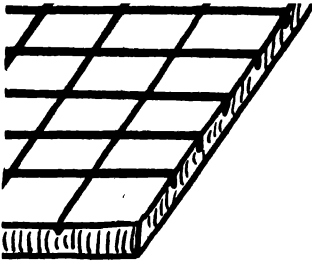
The feature most difficult of good reproduction is the portrait which appears on the face of every note. The portraits of the famous Americans on United States paper money

identify the denominations of the bills on which they appear, as follows

\$1	Washington	100	Franklin
2	Jefferson	500	McKinley
5	Lincoln	1,000	Cleveland
10	Hamilton	5,000	Madison
20	Jackson	10,000	Chase
50	Grant		

The distinct and lifelike appearance of the genuine portraits is an effect achieved by artistically engraved dots and lines. The oval background around each portrait is made up of a series of tiny squares formed by the crossing of very fine vertical and horizontal lines. On the genuine bill the portrait and the background are clean and clear. On most counterfeits, the face-shading in the portrait is noticeably defective, and many of the little squares in the background are filled with ink or are flecked with white where the lines are broken. In the genuine portrait the eyes are always lifelike and expressive, but in most counterfeits they are dull, distorted or otherwise executed so that they are obviously inferior to the genuine.

Good money looks good.



Genuine engraved plate makes clear lines.

It is these differences between the genuine and counterfeit portraits which prompt the Secret Service advice to the money-handler to compare any questionable bill with another of the same type known to be genuine.

There are only three basic types of paper money issued by the United States: (1) silver certificates, (2) United States notes and (3) Federal Reserve notes. As a war measure, the Treasury Department in December 1942, released \$660,000,000 in National Currency notes, Series of 1929, but the government no longer prints currency of this type, and the issue is being retired as the notes wear out.

On the face of every genuine bill appears a small circle edged with sharp points like the teeth of a saw, enclosing an angle square under which is a key and over which is a balance scale, all mounted upon a dotted white shield within the circle. This is the Treasury seal, as indicated by the abbreviated Latin words surrounding the design, *Thesaur. Amer. Septent. Sigil.*, meaning *Thesauri Americae Septentrionalis Sigillum*, translated "Seal of the Treasury of North America." The color of the Treasury seal will quickly denote the type of bill on which it appears. On silver certificates the seal and the serial numbers are printed in blue; on United States notes they are in red, and on Federal Reserve notes in green. On the National Currency notes, Series of 1929, previously mentioned, the seal and serial numbers are brown. In addition, the type of note may be identified by the words "Silver Certificate,"

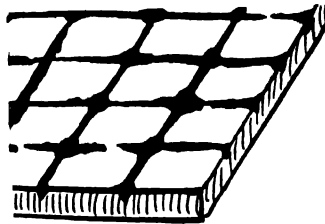
"United States Note," or "Federal Reserve Note," engraved at the top center of the face of a bill.

The counterfeiter usually finds it difficult to print a Treasury seal on which the points are as sharp and clear as they are on the genuine. On most counterfeits the points are dull or broken, and here again a comparison will reveal the counterfeit.

The serial numbers on genuine United States currency are printed in a distinctive type style, obtainable only by the Bureau of Engraving and Printing. The counterfeiter, therefore, must either use numbers unlike the genuine or must try to copy the genuine numerals. In the first instance, a comparison will show the difference in the style, and in the second instance the imitated numbers are generally spaced poorly or are aligned crookedly, and again a comparison will show that they are not authentic.

The border design of every genuine bill includes an intricate pattern of fine white lines in a fish-net motif. This pattern is produced

Bad money looks bad



Etched counterfeit plate makes broken lines.

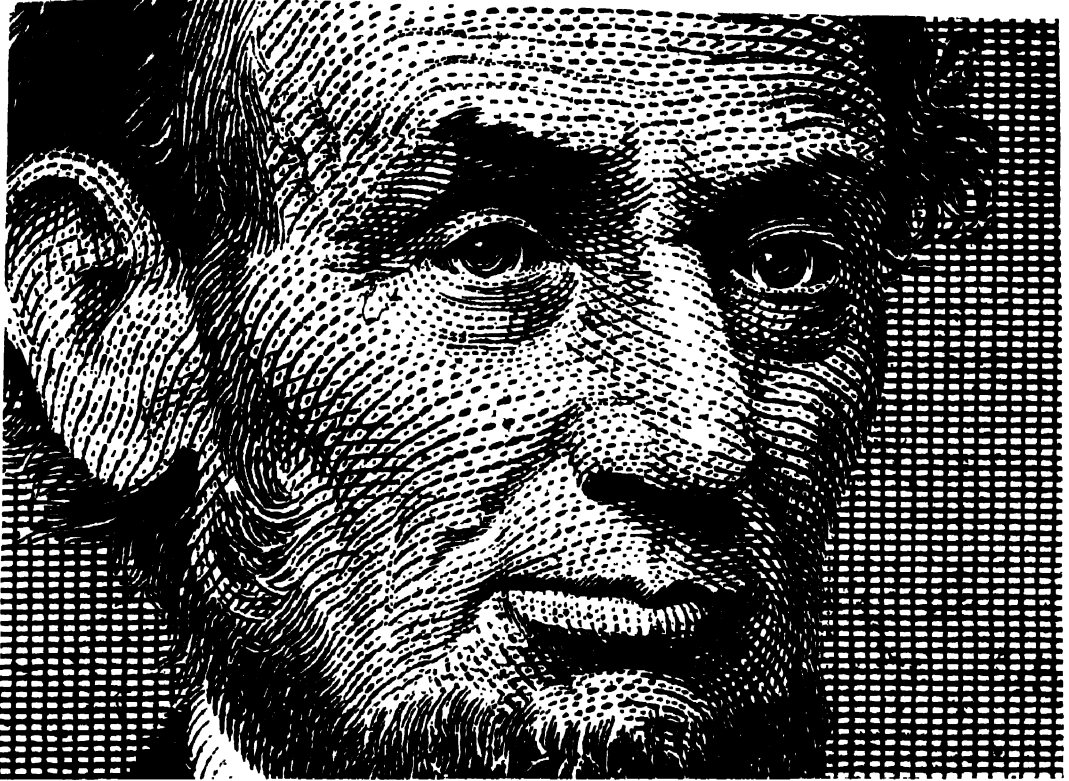
by a complicated machine known as a geometric lathe, and the lines are called geometric lathe-work. In a genuine bill the lines are clear and unbroken. On most counterfeits, however, the border is too dark because many of the lines are obscured by black patches of ink due to inferior etching, or the white lines may be thicker than the genuine, thus creating a splotchy or a bleached effect.

It is a common belief that rubbing a bill on a piece of paper will prove whether it is genuine or counterfeit, through removal of the color. This is definitely a fallacy. The ink can be rubbed from a good bill as well as a bad one.

Counterfeit Coins.—The losses by victims of counterfeit coins are not as great as those resulting from acceptance of bogus bills, because there is a wide margin of difference between the value of metal money and the representative value of paper money. However, the passer of counterfeit coins depends upon the carelessness of his victims in the same way as does the passer of counterfeit bills. Potential victims of the coin passer can learn to detect spurious coins by a few simple observations and tests.

Genuine silver coins have a corrugated outer edge, known as the reeding. Consisting of evenly spaced ridges, the reeding was originated to prevent unscrupulous persons from cutting or filing from the edges of the coins small bits of silver or gold, which they would then sell for the value of the metal so accumulated.

COUNTERFEITING



Enlargement of genuine portrait of Lincoln.



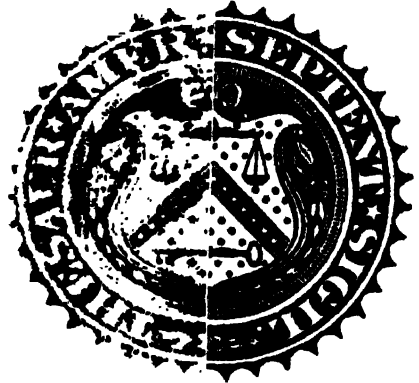
Enlargement of counterfeit portrait of Lincoln.

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COUNTERFEITING



Composite enlargement of numeral and counter from genuine and counterfeit \$1 Silver Certificate.



Composite enlargement of portions of genuine and counterfeit Treasury seal.



Enlargements of genuine and counterfeit 25c coins, showing differences in reeded edges.



Composite portrait of Hamilton, from genuine and counterfeit \$10 notes.

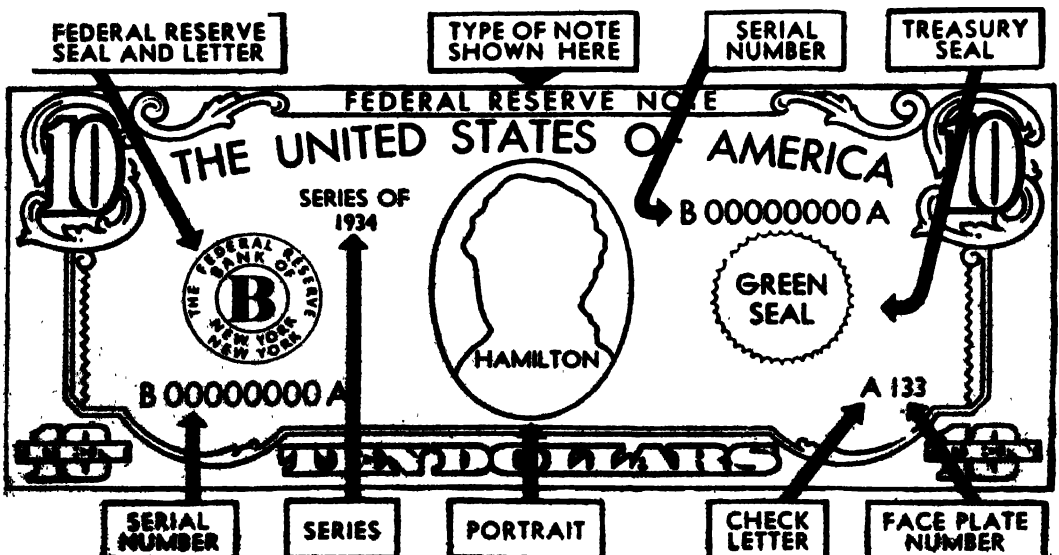


Diagram of \$10 Federal Reserve Note.

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Later, however, the reeded edges of silver coins formed considerable protection against counterfeiting, as they are difficult to reproduce perfectly. On most counterfeit coins the corrugations are only partially executed, or unevenly spaced, or entirely missing in places, and a comparison of a questionable silver coin with one known to be genuine, or even a careful inspection of the ridges around a questionable coin, will usually indicate whether it is good or bad.

Genuine silver coins, when dropped on a hard surface, produce a clear, bell-like ringing sound. Most counterfeit coins are made of metal alloy which is much softer than silver. Therefore, questionable silver coins should be dropped on a hard surface to test their ring, and should be cut with a knife to test their quality. If a coin sounds dull or is easily cut, it is undoubtedly a counterfeit.

Most counterfeit coins feel greasy, so it is wise to feel all coins, and if one feels slippery or greasy it should be examined further for defects in the reeding or other characteristics.

Bogus silver coins may be detected with a solution, the formula for which is as follows:

Nitrate of silver.....	10 grains
Nitric acid.....	1 cc.
Distilled water.....	30 cc.

The silver test may be obtained for a few cents in any drug store. A single drop applied to a counterfeit coin which does not have a high silver content will bubble and turn black instantly. The solution will not discolor a genuine silver coin and will not react on a counterfeit coin which is made of silver or which contains a high percentage of silver, but since most counterfeits are made of base metal the acid will detect them. It cannot be used to detect counterfeit pennies or nickels, or gold coins.

To the recipient of counterfeit money the Secret Service gives this advice:

- (1) Do NOT return it.
- (2) Notify police at once.
- (3) Try to delay the passer by making some natural excuse.
- (4) Avoid argument. If necessary, say the police will handle the matter.
- (5) If the passer leaves before police arrive, write down his description.
- (6) Write down the license number of any automobile used by the passer or his accomplices.

The federal laws for the protection of obligations of the United States provide that any person who has custody or control of counterfeits of such obligations and shall fail or refuse to surrender them to an authorized agent of the Treasury Department shall be fined not more than \$100 or imprisoned not more than one year, or both. All banking institutions are such authorized agents under an order issued by the Secretary of the Treasury 17 Oct. 1941, and amended 29 Jan. 1942, and are empowered to confiscate counterfeit money for surrender to the Secret Service.

Counterfeiting is a felony, and under the law any person who has knowledge of the commission of a felony recognized by the federal courts, and who does not at once make such knowledge known to the authorities, shall

be fined not more than \$500 or imprisoned not more than three years, or both. (Section 286, Title 18, United States Code of Laws.)

The manufacture or passing of counterfeit bills is punishable by a fine not to exceed \$5,000 and maximum imprisonment of 15 years. (Sections 264-265, Title 18, United States Code of Laws.)

Late in 1944 the United States Criminal Code was amended by an act making those who conspired to make counterfeit bills and other obligations liable to sentence of 15 years or a fine of \$5,000 or both, as in the case of offenders who actually produced such counterfeits. (Section 178a, U.S. Criminal Code, Section 293a, Title 18, U.S. Code.) Prior to enactment of this legislation, the penalty for conspiracy to counterfeit was imprisonment for not more than two years, or a maximum fine of \$10,000, or both. (Section 88, Title 18, U.S. Code.)

The making or passing of counterfeit gold or silver coins intended for the use and purpose of current money, whether in resemblance of coins of the United States or of foreign countries, or of original design, is punishable by a maximum fine of \$3,000, or imprisonment for not more than five years, or both. (Section 281, Title 18, United States Code of Laws.)

The making or passing of counterfeit minor coins is punishable by a maximum fine of \$1,000 and maximum imprisonment of five years, under Section 282, Title 18, United States Code of Laws. An amendment to this Section, designated Section 282-A, approved 1 April 1944, prohibits the unlawful use of tokens, slugs, disks, or other devices similar in size and shape to the coins of the United States, fixing a penalty of a fine not to exceed \$3,000 or imprisonment for not more than one year, or both.

FRANK J. WILSON,

Chief, United States Secret Service.

Consult: Crump, I., *Our United States Secret Service* (New York, 1942).

COUNTERMARK, in numismatics, the name given to those stamps or impressions which are found on ancient coins or medals, and have been given since their first impress. These countermarks or stamps are often executed without any care, and frequently obliterate the most interesting portion of the original inscription. There have been various opinions respecting the cause of these countermarks; some antiquaries thinking that they were to indicate an augmentation of the value of the money upon which they were stamped; others, that they were vouchers for workmen, and, again, that they were only struck upon money taken or received from foreign enemies. During the long war with revolutionary France Britain stamped millions of Spanish dollars with small, oval countermarks of the head of George III upon the neck of the Spanish monarch. Many of them were completely re-stamped or countermarked in the mint, but the new impression sometimes failed to obliterate the old entirely.

COUNTERPOINT, from the Latin, *punctus contra punctum* (note against note), the correlation of simultaneous melodic elements; also, a melodic element which is played against a pre-determined melody (*cantus firmus*). While the

term "melodic" does not exclude qualities of melodiousness or thematic salience, it pertains to broader considerations of linear continuity.

Counterpoint, polyphony, and homophony stand in an interesting relationship to each other. The first term usually refers to the precise nature, often the syntactic features, of combined parts. Polyphony refers to a type of music characterized by the simultaneous appearance of thematic or markedly melodic elements. Contrapuntal values are therefore a clearly recognizable factor in polyphonic music. But similar values are present in homophonic music, wherein a predominant melodic element is supported by an essentially chordal accompaniment. Because the bass, in particular in this style, is a separable linear element, regardless of the degree to which its contours might be a series of melodic stereotypes due to harmonic considerations, it forms continuous relationships with the principal melody. It is in such interdependence of moving parts that the essence of counterpoint lies.

In this sense counterpoint, as the source of homogeneous linear activity, is a factor common to many kinds of music, from the polyphonic *ricercare* to the simplest setting of a hymn tune. The musical analyst who points out the presence of passing or neighboring chords or tones, or suspensions, is thereby isolating rudimentary contrapuntal features. Indeed, many chords and chord progressions which are usually regarded as harmonic components of music are, in fact, contrapuntal derivatives. On a more abstract level contrapuntal as well as harmonic forces act as agencies of musical design, insofar as these forces give shape and direction to the details of musical texture. Thus, in the crucible of counterpoint, homophony turns out to be a congealed polyphony, and polyphony a liquefied harmony.

Counterpoint, often qualified by the terms "strict" or "species," and "free" is also a disciplinary study pursued by the student of music. In strict or species counterpoint certain laboratory restrictions are imposed by reducing to a minimum such accessory factors as harmonic logic, elements of motif, and particularized expressiveness, in order to emphasize and control the relationships generated solely by moving parts under stipulated conditions with regard to rhythm and the treatment of consonances and dissonances. Often this study is related to aspects of 16th century vocal polyphony and leads to the composing by the student of motet-like pieces. The study of free counterpoint is usually modeled after instrumental polyphonic practises of the Baroque era and in its turn leads to the composing of canons and fugues in the manner of the period. But the benefits of these studies lie less in the imitation of specific historical styles than in the inculcation in the student of elementary contrapuntal techniques which have an eventual validity for all styles. See also HARMONY.

WILLIAM J. MITCHELL,
Professor of Music, Columbia University.

COUNTERSIGN, in military affairs, a means of mutual identification in a combat area or, under special conditions, in garrison. It consists of two elements: a secret challenge given by a sentry after his initial routine challenge; and a secret response (the password)

of the person approaching, given only after hearing the proper secret challenge. The secret challenge and the password may consist of words or distinctive sounds. They are changed at irregular intervals, but often enough to maintain secrecy. Possession of the password does not in itself constitute a right to pass. The challenged person may be subjected to further scrutiny to establish his identity and authority. Unauthorized disclosure or use of the countersign in time of war is a capital offense under Article 101 of the Uniform Code of Military Justice. In some foreign armies the password alone is referred to as the countersign.

VINCENT J. ESPOSITO.

COUNTRY- or **CONTRE-DANCE**, the generic name for a whole series of figure dances of rural English origin; more specifically, the name given dances in which a number of couples stand at the beginning of the dance opposite each other, in two lines, an example being the *Sir Roger de Coverley*. Country-dances moved from the rural scene to aristocratic circles, and became popular with Queen Elizabeth I. John Playford's *English Dancing Master* (1650) is still the authority for both steps and tunes. It is probable that the country-dance was imported into France at the close of the 17th century and from there to Germany. *Contre-dance* is a corruption of country-dance.

COUNTY, a political and administrative subdivision through which important functions of government are performed in Great Britain, the British dominions, and the United States. At the time of the English settlements in North America the county in the mother country was the principal unit for the enforcement of law, the administration of justice, and representation in Parliament. It is not surprising therefore that counties were established in all the thirteen colonies and subsequently in the other states of the United States. The only exception, and that in name only, is that the unit of government in Louisiana corresponding to the county in other states is called the parish. Except for a number of independent cities, such as Baltimore, Md., St. Louis, Mo., and a group of Virginia cities, every part of each state has been included in some county. Several of the larger cities are coextensive with counties, Philadelphia, New Orleans, Denver, and San Francisco being important examples; and New York City contains five counties.

In Great Britain large boroughs usually are counties by themselves. From 1888, it became customary to advance a borough to the rank of county borough on its reaching 50,000 population, but in 1926 the population requirement was raised to 75,000, and in 1945 to 100,000.

There are in the United States approximately 3,000 counties. In New England they are of less importance than the township, and they achieve probably their greatest importance in the South and the Far West. The range in area of about two thirds of the counties is from 300 to 900 square miles. San Bernardino County, Calif., with 20,131 square miles, is the largest. Most counties were established as they now are before the invention of the automobile, and their size was roughly adjusted to public convenience in a time of horse-drawn vehicles and dirt roads. The variation in population is even more striking

than in area, extending all the way from a few hundred to three or four million. About half of all counties have less than 20,000 population, and the great majority are distinctly rural in character. Except in New England and in the other states in which there are organized towns or townships (New York, New Jersey, Pennsylvania, Ohio, Indiana, parts of Illinois, Wisconsin, Michigan and Iowa) the county is the only unit of rural local government. It is thus for many millions of Americans the only unit through which their desires for local self-government can be expressed.

The county is everywhere in the United States the primary unit of judicial administration, and the principal trial courts for both civil and criminal matters sit periodically in its courthouse. It is common to combine two or more counties in the organization of the circuit or superior court, but where this is done the judge sits alternately in each county, and each county has its own clerk, prosecuting attorney, sheriff, and jail. Except in some New England states, the recording of legal instruments such as deeds and mortgages and the probating of wills is on a county basis. The courthouse thus becomes the center of many of the most important contacts between the citizen and his government. Except, again, in New England, the county is the unit employed by the state in the conduct of its general elections, and, as a result, it is ordinarily the basic unit of party organization. This fact has an important bearing on the ill success of efforts to simplify local government in any manner which involves the elimination or combination of counties, or even the alteration of their boundaries.

Other functions of government commonly entrusted to counties outside New England are the building and maintenance of highways and bridges and the relief of the poor, including the conduct of almshouses and other institutions. The sheriff has important duties with regard to the enforcement of law and the preservation of peace, especially in rural sections, though there is nowadays an increasing tendency to entrust these matters to a professional state police force. The county frequently is the unit for public health activities. It is also the center of elaborate state and federal agricultural programs. In some states it is the unit of school administration and where schools are organized by smaller local units exerts some form of supervision of their activities. Incidental to its other functions the county provides for the assessment of property for tax purposes and for the collection of property taxes for those states which continue property levies, for the county, and frequently for cities, townships, and school districts. (For the manner in which counties are organized to perform their functions see **COUNTY GOVERNMENT IN THE UNITED STATES**.)

The pattern of county boundaries, which has not been subject to the slightest change for two generations, is today inadequate for counties containing large cities or forming parts of the extended metropolitan areas, and for the poorer rural sections of many states. In neither of these cases does it now correspond with the social and economic facts of the situation. County lines cut some metropolitan areas into fragments which prevent integrated solutions of metropolitan problems. Even where a single county contains all or most of the metropolitan area it cannot render the services required by the population pouring

out of the urban center except by costly duplication of what could be better done by the nucleus city. If, as it usually does, the county taxes property in the nucleus city and spends the proceeds in the suburbs, there is serious cause for dissatisfaction. On the other hand, in the poorer rural sections hundreds of counties have not the tax resources necessary to provide even primitive rural services to their people. This is particularly true as to roads, education, and welfare activities. These counties continue to function only by virtue of state subsidies which are proportionately much larger than in the cases of more populous and wealthier counties. In most states the work of county government could be done better and more economically by one third to one half the present counties. Even at two or three times their present size, counties would be easier to traverse than were existing counties fifty years ago. Obvious as these facts are, and though frequently called to the attention of the public, the number of consolidations since 1900 of counties with other counties or with cities has been very few.

COUNTY BOARD, the body which under a variety of names and with various forms of organization and powers serves as the governing body of all counties in the United States except those in Rhode Island. There are two main types of such boards, small boards of from three to seven members, and large boards of ten members or more. Board members are popularly elected in all states except Connecticut and South Carolina. The members of small boards, who may be chosen at large or by districts, are most frequently called county commissioners and are to be found in New England, Pennsylvania, Maryland, Ohio, Indiana (see **COUNTY COUNCIL**), part of Illinois, Nebraska, Kansas, Minnesota, the Dakotas, California, Oregon, Washington, Idaho, Montana, Wyoming and Nevada, besides several southern states. Boards of this type usually are contrasted by writers on local government with the large boards of supervisors found in New York, Michigan, Wisconsin, and most of Illinois. These latter boards are made up of township supervisors, who are the principal administrative officers of their townships, and of representatives elected from the cities within the county. Boards of supervisors in counties containing large cities are often of such great size as to be very unwieldy. It is entirely unsafe, however, to classify county boards in accordance with their names alone. There are small boards in Virginia, California, and Mississippi, which are known officially as boards of supervisors. In other states, like Missouri and Oregon, they are called county courts, while the small boards in most New Jersey counties are called boards of chosen freeholders. On the other hand, there are large boards in some southern states which are made up of locally elected justices of the peace and retain the name of court, while in Louisiana the governing body of the parish (county) is a large board elected by "wards" and known as the "police jury" (see **COUNTY GOVERNMENT IN THE UNITED STATES**).

The members of small county boards in large counties often receive substantial salaries and devote all or a considerable portion of their time to affairs of the county. Township supervisors, in addition to their regular salaries, receive some compensation for their services on the county

board. In the great majority of small counties, board members merely receive nominal salaries or none at all.

COUNTY COUNCIL, the name applied to the governing bodies of administrative counties in England and Wales under the Act of 1888 and subsequent legislation. In organization and methods of operation they correspond very closely to the borough councils of English urban communities. The most important of these councils is that of the administrative county of London, known as the London County Council, which exercises broad powers in the management of the largest municipality in the world. The English county councils manage the affairs of their counties through committees, one of which supervises the conduct of the professional head of each of the various departments.

In the United States the term "county council" was introduced in Indiana in 1892. At that time a county council of seven members, four elected by districts and three at large, was established in all Indiana counties, with the exclusive power of levying taxes, making appropriations, borrowing money, and buying and selling real estate. The old boards of county commissioners were retained in a purely administrative capacity (see **COUNTY GOVERNMENT IN THE UNITED STATES**, and **COUNTY BOARD**). The term county council has also been applied in a few cases to the governing bodies of counties reorganized under recent legislation.

COUNTY GOVERNMENT IN THE UNITED STATES. Much has been written on county government in the United States since 1917 when H. S. Gilbertson's *The County, the Dark Continent of American Politics* was published. Despite some improvement in certain features of county government and the advantages taken by a few counties of the county home rule provisions in force in some states to establish well-organized forms of government, the county remains today a jungle of confusion, disorganization, and irresponsibility. Exactly why the forces of reform, which have so vitally affected state government on the one hand and city government on the other, have passed the county by is difficult to explain. Perhaps the best general explanation is to be found in the amorphous character of county government and the close and important connection between this government and the great political parties of the country.

To assert that county government is amorphous is to say merely that the county, except in the case of a few recently reorganized ones, scarcely has a government at all in the same sense that cities do. The governmental activities carried on in the county are not integrated into even a faint approximation of a responsible county agency. County government therefore is not only much more difficult to describe than city government, but much more difficult for the citizen to comprehend and for public opinion to control.

County Government in New England.—The county is at its simplest in New England where it is little more than a judicial district of the state, other usual activities of local government being attended to mainly by the towns and cities. Aside from the judges, prosecuting attorneys, sheriffs, and clerks of court, there are no important county officers. Even the registration of deeds and other documents, a universal county

function outside of New England, is in Vermont, Connecticut, and Rhode Island, taken care of at the town level. In these states there is little for a county board to do except maintain the courthouse and jail. Rhode Island, indeed, manages without any county board at all. In the other New England states, except Connecticut, a board of county commissioners (in Vermont known as assistant judges of the county court) is elected by the people of the county, but in New Hampshire and Connecticut the levying of taxes and making of appropriations are left to a biennial convention of the members of the legislature from the county, while in Massachusetts estimates of the county commissioners must be passed upon by the legislature as a whole. The New England county, in other words, is almost wholly an agency of the state government and the element of local popular control has been reduced to lower terms than elsewhere in the country. The county in New England cannot be said to have much to do with local self-government.

The County as an Agency of the State.—

Having dealt with county government in the six New England states, it is possible to speak in reasonably general terms of county government in the remainder of the country, for while there are many variations in details, county governments elsewhere follow essentially the same disordered pattern. That pattern owes its principal characteristics to two factors. The first of these is the necessity of each state to have some reasonably uniform territorial organization to make its laws and policies effective throughout its borders. The county filled that need in 17th century England and it was natural that the colonists should have established a similar unit of administration in their new settlements. The county was from the beginning a comprehensive unit covering every settled part of each colony. In the colonies from Maryland south, except Virginia where in the early days the "parish" was an important unit of local policy, it was the only such unit. In the remainder of the colonies the county existed concurrently with a smaller unit, the town. It differed radically from units like cities, boroughs or villages, set up primarily to serve the special needs of their inhabitants, because its chief reason for existence was to serve the interests of the colony as a whole.

The early counties, like those of England prior to 1888, were set up primarily to provide for the enforcement of law and the administration of justice, although they performed other functions such as the care of the poor or the repair of roads and bridges by issuing court orders addressed to individuals or minor local units. For example, the law in the Massachusetts Bay Colony required each town to maintain a school, but it was the county court which enforced the law by citing before it and fining towns which balked at the performance of this duty. As the colonies became states and new states were added to the Union, counties spread over the whole country. A new officer, the prosecuting attorney, unknown to the English law, was added to the traditional sheriff, coroner, and clerk of court. As state activities expanded, administration in the modern sense became necessary and a whole additional crop of county offices was created. Lists of these positions differ only in detail from state to state. Since all through the 19th century both state and local governments depended for their support on the general property tax, a county assessor or

board of assessors was found necessary except in those states with organized township government, and even there a county officer or board was often set up to equalize assessments as between townships. To collect taxes, a county treasurer or tax collector was equally necessary. The frequency of real estate transfers in a new country made desirable a system of registration of all documents relating to the sale or mortgaging of lands and buildings. This function often became one of the duties of the county clerk, an office sometimes combined with that of the clerk of court. In some counties, however, there was a separate registrar of deeds. Another officer found in most counties was the surveyor whose function, now of little importance, was to make authentic surveys of lands in order to settle or head off boundary disputes which were very common in a new and rapidly growing country. With the development of public school systems the county became the actual unit of educational administration in only a small minority of the states but in states with district or township units there was usually set up a county superintendent and often a county board of education with very mild powers of supervision over district or township schools. All the above officials were primarily in the service of the state but with rare exceptions they were not made directly responsible to any state authority.

The second of the factors determining the character of county government was that during the same period in which county offices were being multiplied, prevalent American political theory leaned heavily in favor of popular election of public officials. In general, the whole list of officials, from circuit judge to county superintendent of schools, was made elective by the voters of the county or, in the case of the judge, by the people of the circuit. Such control as the state exercised over these public servants was by virtue of long and detailed statutory definitions of their powers and duties, a control in one sense more rigid than would have been exercised by an administrative superior in the state capital, but scarcely as effective. Owing their offices to the people of the county, these officials carried out their state-imposed activities in the way most satisfactory to their constituents. The general effect was a degree of decentralization fatal to the vigorous execution of the policies of the state. Not only were county officials not effectively tied to the state government, but they had no organization among themselves. Each was independent of the other, and any teamwork among them was due to the innate good feeling of the individuals concerned or to their common domination by a party machine or boss. The states in the formative period did not set up any general organ of county government other than the county board (see COUNTY BOARD). There were such boards in all states outside of New England. They generally were elected by the people of the county and had nominally the power of the purse, that is, they made appropriations and levied taxes for the support of the county government. In fact, however, the amounts of many expenditures were mandatory under state law. Further, it was common practice until well into the 20th century for many of the principal county officers—sheriff, clerk, tax collector, etc.—to be paid by fees which they collected, in turn paying their deputies or assistants and other expenses of their offices and retaining the balance for themselves, thus making

them entirely independent of the county boards. This condition still continues in several of the states. Where it does not survive, the law often so minutely specifies the salaries of county officers and the number and compensation of their staffs as to leave the county commissioners or board of supervisors, as the case might be, powerless to control them. The abolition of the fee system, while beneficial in many ways, has scarcely at all enhanced the authority of the county board.

The developments of the first fifty years of the 20th century have had on the whole very little effect on this situation. The principal traditional county offices are frequently so embedded in the constitutions of the states as to block all attempts to bring them into any scheme of responsible county government. There are isolated cases of reform, such as the appointment of the sheriffs in the five counties of New York City by the mayor. Sheriffs in some counties have been bypassed as law enforcement officers by the creation of county police forces under the control of the county board. The merit system has been extended to county positions in a few instances, but by and large, county appointive offices are still treated as political spoils. Accounting procedures have been improved and in some cases a county auditor or other fiscal officer has been introduced, with some powers of control over the receipts and expenditures of even the elective officials. The improvements which have been made in county organization, however, relate as a rule only to the activities under the control of the county board. Even in those counties which have adopted the county manager plan the relation of the county board to the traditional county officers has scarcely been altered.

The County as a Unit of Local Self-Government.—As previously stated, the county has from the beginning had some powers of local self-government. These powers have gradually increased in importance, especially in the populous counties adjacent to or including large cities. Counties, historically speaking, were not municipal corporations and had only those powers specifically conferred on them by the legislature. In some states their powers are still much restricted. However, in others—Virginia for example—they have been given power to do practically anything which a city can do in such fields as planning, zoning, building regulation, and many varieties of public works. Many counties today spend large sums of money in the performance of functions which at the turn of the century would have been regarded as peculiarly municipal. While county functions for the most part are still confined largely to the construction and maintenance of courthouses, jails, roads and bridges, and to provisions for health, welfare (that is, the various forms of relief), and, in some states, schools, the sums of money to be spent on these objects have increased so much as to greatly enhance the importance of what may be called the discretionary powers of county government.

Such discretionary functions as were exercised in English counties at the time of the settlement of the thirteen colonies were vested in the Court of Quarter Sessions, consisting of justices of the peace appointed by the crown from among the landed gentry. In the colonies the control of county affairs likewise originally belonged to the courts. Early in the independent history of the United States, however, these were generally replaced by elective county boards, thus giving the

county a genuinely representative governing body for the limited functions within their jurisdiction. It cannot be said, however, that county boards as a rule have distinguished themselves in the exercise of these self-governing powers, especially when the functions concerned have reached considerable proportions. A number of factors have contributed to this result. Counties were slow to recognize the necessity of professional assistance in the performance of their duties. In those states in which the county board is chosen by districts, the care of roads and bridges in each district was originally left to the member from that district. This worked fairly well when road building could be carried on by any group of farmers with the assistance of primitive plows and scrapers. Even today in many wealthy counties which employ engineers to design their roads, the spending of money on construction and maintenance of roads and the selection of the men to be employed on them are left to the members from respective districts. Where the county board is elected at large, a similar result is obtained by dividing the board into committees on courthouse, roads, county home, and the like, each committee tending to become an independent agency with which other members of the board do not interfere.

There has been little to choose between the large boards of New York and of the states which have copied her "town supervisor" system, on the one hand, and the three-member boards of Pennsylvania and Ohio. Probably the basic reason for the failure of all types of boards to evolve a first-rate system of county administration lies in the fact that except in strictly rural counties county government in general is too far removed from the effective control of public opinion. Counties in which there are cities of any considerable size usually render little or no service within the city limits except the maintenance of the courthouse and the courts and judicial offices located there. The people of the city take little interest in the county government and are frequently hopelessly under-represented in it. On the other hand, the high assessed valuations in the city provide at moderate rates of taxation most of the money lavished on the remainder of the county. City voters have a tendency to write off county government as a bad job and either do not vote in county elections or simply support the party to which they belong. The county people are satisfied with what they are getting and the county political machine runs on smoothly without danger of upset. Of course, there are counties in which this situation is reversed but they are decidedly the exception.

It is not surprising under these circumstances that the movement for reform in county government has proceeded very slowly. California in 1914 adopted an amendment to her constitution authorizing counties to amend their charters by electing boards of freeholders in a manner similar to that previously provided for cities. Since that time six other states have given their counties a like privilege: Maryland (1915), Ohio and Texas (1933), New York (1935), Washington (1938), and Missouri (1945). Several states also have constitutionally authorized optional acts permitting the adoption of the county manager and other plans of county government: Montana (1922), Virginia (1928), New York (1935), Oregon (1944), and Louisiana (1945). Optional acts have been put on the statute books in these

and other states: Georgia (1922), North Carolina (1927), Montana (1931), Virginia (1932 and 1938), New York (1935, 1936, and 1937), North Dakota (1941). The "home rule" provisions in the Ohio, Texas, Washington, and Missouri constitutions have produced no county home rule charters. Louisiana has as yet no optional charter act to implement its constitutional provision. The number of counties which have taken advantage of either the home-rule or optional act privileges offered them is extremely limited, although it includes some very large and important counties.

In California five of the principal counties of the state—Sacramento, San Mateo, Santa Clara, Los Angeles, and San Diego—have adopted home rule charters. The first three of these are classed as county manager charters by the National Municipal League in its *Digest of County Manager Charters and Laws*, a loose-leaf publication supplemented from time to time as new charters or laws are adopted. It is to be noted that in Sacramento and San Diego counties the assessor, district attorney, auditor or controller, and sheriff, continue to be elected by the people, as well as the judges. In Santa Clara County the list of elective officers is the same except that the auditor or controller is appointed by the manager, while the superintendent of schools is elected by the people. These are all fair examples of the manager plan as applied to counties and have been in successful operation since the early 1930's.

Los Angeles and San Diego counties require special mention because their charters, adopted in 1938 and 1947 respectively, provide for a distinctive form of administrative organization which in some quarters is regarded as an acceptable substitute for the manager plan in either city or county government. Unlike the manager plan, in which the power of appointment to the most vital positions in the administration is vested in the manager, this power is retained by the board of supervisors. The board appoints in each case, however, a chief administrative officer who serves as the connecting link between the board and the army of employees of these great counties. He has no power other than what he derives from the support of the board of supervisors. In Los Angeles County, now the most populous county in the United States, the relationship between the chief administrator and the board has been one of harmony and confidence, with correspondingly successful results. This probably has been due to the personalities involved rather than to the overall merit of the system. Experience in San Diego County has been too short to warrant drawing valid conclusions.

Three of New York's largest counties outside New York City—Westchester, Nassau and Monroe (Rochester)—now operate under charters which provide for effective executive control and modern budgeting and accounting practices. In Monroe County, administrative authority is vested in a county manager appointed by the board of supervisors. In Nassau and Westchester counties there is an elective executive, whose powers are substantially the same as those of a manager. Monroe County has retained the large board of 43 supervisors, elected one from each of 24 city wards and 19 towns. The Westchester board is even larger. Both boards exceed in size the upper chambers of many state legislatures. Nassau County, which contains but three towns and two cities, has a board of five supervisors.

Two additional county manager charters, those

of Anne Arundel and Montgomery counties in Maryland, adopted in 1949, complete the crop of modern charters springing from home rule charter provisions in state constitutions. The use of optional acts, where provided for, likewise has been by no means extensive. The Virginia law has been used four times, the North Carolina law twice, and the Montana law once to adopt the manager plan. By far the most liberal of the optional acts are the three operative in New York which offer to all counties outside New York City, 16 forms of government, with opportunity for numerous minor variations in each. The very variety of these options, however, results in their use for piecemeal amendment of the existing system of government rather than for wholesale reorganization.

A few other county governments have also been reorganized by special acts, the most important of which provided the manager charter of Fulton County (Atlanta), Georgia, which, however, does not attempt to bring the traditional constitutional officers under the authority of the manager. Altogether there were in June 1950 15 county manager governments of approximately standard pattern in the United States and perhaps twice that number of counties in which some kind of elective or appointive county executive existed. The remainder of the counties in this country still had the traditional formless type of government described in the early sections of this article.

The actual operation of counties as units of local self-government has been more deeply affected by certain economic developments of recent years than by conscious efforts at reform. The importance and costliness of the highways required by the automotive age have brought about in several states the absorption by counties of the highway activities of the townships, leaving the latter units little excuse for existence. On the other hand, more and more former county roads have been included in state highway systems administered directly by state highway departments. In North Carolina, responsibility for the construction and maintenance of all roads has been assumed by the state. In 98 of the 100 counties of Virginia, the state highway department takes care of all roads, both primary and secondary. It has been the experience of Virginia that as counties cease to have roads to look after, the county engineer is likely to disappear from the list of county offices and the county gradually stops performing any activities involving engineering skill.

When the United States government, in the Social Security Act, undertook old-age assistance and provided for aid to the blind and to dependent children, the county, in a majority of the states, became the unit through which a vastly increased volume of relief funds were to be expended. At the same time, however, the conditions on which federal aid was forthcoming required that the county agencies which actually administered relief should be organized on a uniform pattern; that the heads of these agencies should be persons approved by the state department of welfare in accordance with standards prescribed by the federal authorities; and that other personnel should be appointed from eligible lists based on examinations set up by the state departments of welfare. The county welfare agencies thus came to present, from the point of view of the professional character of their staffs,

a marked contrast to the other offices and departments of most county governments.

Education is technically and legally regarded as a state function, but the basic units through which education is provided often present the best examples of local self-government in the United States. In the great majority of states this basic unit is a district smaller than the county, and the county board of education or county superintendent of schools, one or both of whom are found in most of these states, act in a supervisory capacity. There are, however, 11 states in which the county, except where embracing large cities, is the actual unit of educational administration. These states are Alabama, Florida, Georgia, Kentucky, Louisiana, Maryland, North Carolina, Tennessee, Utah, Virginia, and West Virginia. In six of these states a board of education is elected by the people. In Georgia the board is appointed by the grand jury but the superintendent is elected by the people. In Tennessee, school boards are elected by the people in some counties and appointed by the county court in others. In Virginia they are appointed by an electoral board which in turn is appointed by the judges of the circuit court. In only two states—North Carolina, where they are appointed by the legislature, and Maryland, where they are appointed by the governor—is there any approach to state centralization of authority. These boards vary from 3 to 19 members, with 5 the most frequent number. In seven of this group of states the county board appoints the superintendent. In Alabama some superintendents are elected and some appointed by the county board of education. In Tennessee some are elected by the people and some appointed by the county court. Only in Florida and Georgia is popular election the general rule. The number of states with county-wide units for furnishing education to the people has been slowly increasing but as yet has not penetrated north of Maryland. County government today provides more services for vastly more people than ever before in its history. Unless present trends are reversed it is destined to occupy a constantly increasing place in the lives not only of rural but of many densely populated urban communities. The genuine reorganization of county government will be a major problem of American democracy in the second half of the 20th century.

THOMAS HARRISON REED,
Municipal Consultant, Wellesfield, Conn.

COUNTY SEAT, the name given in the United States to the locality in which the county courthouse and other county offices are situated. It is still possible, in some parts of the old South, to find county courthouses in the open country apart from any center of population, but this is very rare. If there were no inhabitants in the immediate vicinity when the courthouse was built, its presence usually attracted them. In the period of continental settlement there often was great rivalry among budding metropolises as to which should have the advantage of being the seat of the county government. As a result many state constitutions forbid the establishment or removal of a county seat except after a popular referendum. The resistance of businessmen and other inhabitants of county seats, as well as that of county politicians and office holders, has been an important factor in preventing the consolidation of counties.

COUP D'ETAT, cōō dātā', in politics, a sudden and decisive stroke of policy, usually unconstitutional and often accompanied by violence, by which the existing terms of government are drastically altered. The phrase is French in origin, meaning literally "stroke or blow of state." Although lacking in exact definition, it generally implies the extension of governmental authority by the ruling power through the use of arbitrary and coercive means, as distinguished from the revolutionary overthrow of a government by civil war or insurrection. There were at least three events in France commonly so characterized. The "18 Fructidor" (the French Revolutionary calendar term for September 4) was a "bloodless revolution" in 1797, creating little widespread interest among the people, in which the republican party defeated the party of reaction. The "18 Brumaire" (November 9, 1799) was another "bloodless revolution," executed by Napoleon Bonaparte and making him practically the ruler of France. On December 2, 1851, Louis Napoleon, who was then president, dissolved the assembly by a coup d'état. By skillfully manipulated and controlled plebiscites, he then persuaded the French people to extend his term as president to ten years (the constitutional limit having been four years) and in 1852 to make him emperor.

COUPE, kōō-pā', a four-wheeled carriage carrying two persons inside, with a seat for the driver outside; also, a type of continental stage-coach or a half compartment in British railway cars. The word coupé is best known in America when applied to a type of two-door automobile body seating two to five persons.

COUPER, kōō-pēr, William, American sculptor: b. Norfolk, Va., Sept. 20, 1853; d. Easton, Md., June 23, 1942. After studying at the Cooper Institute, N. Y., he went to Munich, Germany (1874), where he studied at the Royal Academy, and then to Florence, Italy (1875), where he entered the studio of Thomas Ball, whose daughter he married (1878). Returning to America in 1897, he established himself in New York City and became well known for his ideal works, portrait statues, busts, and bas-reliefs, among which were a statue of Henry Wadsworth Longfellow and busts of President McKinley and Robert E. Peary.

COUPERIN, kōō-prān, François (surnamed LE GRAND), French composer and clavecinist: b. Paris, Nov. 10, 1668; d. there, Sept. 12, 1733. The most distinguished member of a prominent musical family (see COUPERIN FAMILY), Couperin studied with his father and later with Jacques Thomelin, whom he succeeded as organist of the royal chapel in 1693. Established as organist at the Church of St. Gervais since 1685, he was appointed clavecinist and organist to the king in 1701 and *Ordinaire de la musique* in 1717. He was highly esteemed by Louis XIV, whose family he instructed in music and for whom he composed his *Concerts Royaux* (1714-1715; published 1722). Besides court compositions, he wrote many sacred works, including two organ masses, long attributed to his uncle, Sieur de Crouilly; but his fame rests chiefly on his *Pièces de clavecin*, programmatic dance suites, of which he published four volumes (1713, 1716, 1722, and 1730). Couperin also published four trio sonatas, entitled *Les Nations* (1726), and a group of ensemble

pieces, *Les goûts réunis* (1724), which, with *Le Parnasse, ou l'apothéose de Corelli* (1725) and *Apothéose de Lully* (1725), brought together the prevailing French and Italian styles. Couperin's music is noted for its individual ornamentation (interpreted in his *L'Art de toucher de clavecin*, 1716) and its intricate rhythms and counterpoint. The influence of his keyboard works is apparent in works of his younger contemporary, Johann Sebastian Bach.

Consult Couperin's works published by Cauchie, Maurice, and others, 12 vols. (Paris 1932-33); also Mellers, Wilfrid, *François Couperin and the French Classical Tradition* (London 1950).

COUPERIN FAMILY, a family of French musicians, who flourished in Paris as masters of the keyboard for nearly two centuries. Members of the family served as organists at the Church of St. Gervais, Paris, successively from the middle of the 17th century to 1826, except for the six-year tenure of Michel de La Lande (1677-1685). The first to become prominent in his profession was LOUIS COUPERIN (b. Chaumes, about 1626; d. Paris, Aug. 29, 1661), the eldest son of Charles Couperin, a merchant and organist in Chaumes, Department of Brie (now part of Seine en Marne). A student of Jacques Chambonnières, whom he accompanied to Paris, Louis was appointed organist at St. Gervais around 1650 and in 1656 became a court violinist and a musician in the *Chambre du roi*. His compositions include *Pièces de clavecin*, which contained some of the earliest examples of the *basso continuo* style in French harpsichord music.

The Couperin line was carried on by Louis' two brothers, François and Charles. CHARLES COUPERIN (b. Chaumes, April 7, 1638; d. Paris, 1679), the youngest of the brothers, succeeded Louis as organist of St. Gervais. He was the father of François, the most renowned of all the Couperins (see COUPERIN, FRANÇOIS), whose two daughters, MARIE-MADELAINE (b. Paris, March 11, 1690; d. Abbaye de Maubuisson, April 16, 1742) and MARGUERITE-ANTOINETTE (b. Paris, Sept. 19, 1705; d. 1778), were celebrated musicians, the latter substituting for her father as clavecinist to the king from 1731 to 1733.

Louis' older brother, FRANÇOIS COUPERIN (b. Chaumes, about 1631; d. Paris, 1701 or 1703), was called SEUR DE CROUILLY. Also a pupil of Chambonnières, he was active as an organist and teacher. He was the father of MARGUERITE-LOUISE (b. Paris, 1676 or 1679; d. Versailles, May 30, 1728), a singer, harpsichordist, and member of the *Chambre du roi*; and NICOLAS (b. Paris, Dec. 20, 1680; d. there, July 25, 1748), the successor of his famous cousin, François le Grand, to the post at St. Gervais (1733).

ARMAND-LOUIS COUPERIN (b. Paris, Feb. 25, 1725; d. there, Feb. 2, 1789), the son of Nicolas, was a well-known organ virtuoso, who succeeded his father at St. Gervais in 1748. He was organist to the king from 1770 to 1789 and held other appointments in several Parisian churches. He wrote much church and chamber music. His wife, ELISABETH-ANTOINETTE BLANCHET (b. 1729) was also a prominent organist and harpsichordist.

PIERRE-LOUIS COUPERIN (b. Paris, March 14, 1755; d. there, Oct. 10, 1789), the son of Armand-Louis, was also known as COUPERIN L'AÎNÉ or COUPERIN FILS. He was organist to the king and succeeded his father at St. Gervais eight months before his death. His compositions are found in manuscript and in published collections.

GERVAIS-FRANÇOIS COUPERIN (b. Paris, May 22, 1759; d. there, July 1826), younger brother of Pierre-Louis, succeeded him at St. Gervais in 1789 and was the last of the Couperins to hold that position, although his daughter, CELESTE (b. about 1793; d. Belleville, near Paris, Feb. 14, 1860), who taught singing and pianoforte, played there at the time of his death.

COUPERUS, kōō-pā'rūs, **Louis**, Dutch novelist: b. The Hague, Netherlands, June 10, 1863; d. De Steeg, near Arnhem, July 16, 1923. Of Dutch-Scottish ancestry, he spent his early years in Java, and thereafter traveled extensively throughout his life. After a few ventures in poetry, he published *Eline Vere* (1889), the first of his numerous novels delineating overrefinement and decadence in contemporary life, of which *De boeken der kleine zielen* (4 vols. 1901-1904) is outstanding. He also wrote historical novels, among which were *Dionyzos* (1904), *Antiek toerisme* (1911), and *Xerxes* (1919); short stories; and travel sketches. Many of his works were translated into English.

COUPLET, kŭp'lēt, in poetry, a pair of lines generally of the same length and cadence and rhyming with each other; formerly also known as a distich. A couplet may be part of the structure and thought of a stanza of more verses, or may stand as a separate metrical entity. An example of the first is the couplet which brings the English, or Shakespearean, sonnet to its forceful close. The independent couplet, often called the heroic couplet from its use in the heroic poetry of the 17th century, dates back to Geoffrey Chaucer (1340?-1400) and consists of a pair of rhymed 10-syllable verses (iambic pentameter). Alexander Pope (1688-1744) is generally held to have brought the heroic couplet to perfection. In his hands, the couplet attained a new suppleness often rising to epigrammatic power, as in the famous one from his *Essay on Man*:

Know then thyself, presume not God to scan;
The proper study of mankind is man.

COUPLING, kŭp'ling, in mechanics any device that connects the ends of two adjacent parts, such as two ends of a belt, shaft, or pipe. Shaft couplings may be the flexible type, to allow for misalignment, or the flanged face type, which permits no misalignment. Hooke's universal joint is a type of coupling adapted for transmitting torque between shafts fixed at an angle. Couplings are also used on railway cars (see RAILWAY CARS. PASSENGER AND FREIGHT) and in electric circuits (see RADIO—NATURE OF RADIO COMMUNICATION. —Coupled Circuits).

COUPON. See BANKS AND FINANCE—*Glossary of Terms*.

COURBET, kōōr-bā', **Gustave**, French painter: b. Ornans, June 10, 1819; died near Vevey, Switzerland, Dec. 31, 1877. Destined for the law, Courbet with all his native vigor and independence determined as a very young man that he would become a painter. He studied in Paris with Steuben and Hesse, but soon left his teachers to work by himself. He never joined forces with his impressionist contemporaries against their common enemy, conservatism. Like Manet he did not scorn the Salon, but constantly sent pictures in the hope that they would be ac-

cepted. In 1844 he exhibited there for the first time. Though his works were often rejected by the Salon, he won a medal in 1849, and the next year showed six pictures which occasioned tremendous discussion, among them his most famous work, the *Burial at Ornans*, now in the Louvre in Paris. This sombre and movingly faithful representation of a country interment, with mourners and vested clergy standing about an open grave, shocked the Parisian public because it made no concessions to convention and was an unaccustomed but accurate statement of a painter's fearless observation.

His frequent rebuffs by the Salon led Courbet to exhibit his works in Besançon and to take them to Germany where they and he were much admired. Twice in Paris he staged a one-man show at his own expense. His revolutionary tendencies were not confined to his art; he crusaded for democracy, was openly anticlerical, and in 1870, when director of fine arts, declared the Vendôme column a worthless monument. Under the Commune (1871), he removed it, an act for which he served a six-months prison sentence. Later, faced with the cost of re-erecting it, he fled to Switzerland, where he died.

Courbet himself labeled his work realism and this new dedication to rendering the truth of nature poured life into the moribund academic tradition, making possible the great French flowering of the second half of the 19th century. His portraits are strong, his landscapes and marines stirring, and his extraordinarily life-like paintings of the female nude exerted a great influence on later painters. Courbet's pictures may be seen in many museums in France and elsewhere in Europe and some of his finest are in America.

Consult for biography and criticism Silvestre, Théophile, *Histoire des Artistes vivants* (Paris 1856); Zola, Émile, *Mes Haines* (Paris 1866); Mantz, Paul, "G. Courbet" in *Gazette des Beaux Arts*, (Paris 1878); Estignard, A., *Courbet, sa vie et ses œuvres* (Besançon 1897); Riat, George, *Gustave Courbet* (Paris 1906); Leger, Charles, *Courbet* (Paris 1926); Mack, Gerstle, *Gustave Courbet* (New York 1951).

MARGARETTA SALINGER.

COURBEVOIE, kōōr-bē-vwā', city, France, in the Department of Seine, on the left bank of the Seine River, in the northwest suburbs of Paris. The city has a large electrical industry and manufactures automobiles, bicycles, plumbing supplies, soap, and cosmetics. In 1883 a bronze group, the *Monument de la défense de Paris*, by Louis Ernest Barrias, was erected here. Courbevoie suffered heavy damage during World War II. Pop. (1946) 54,025.

COURCELLE, kōōr-sēl', **SIEUR DE** (DANIEL DE RÉMY), French governor of Canada: b. Artois, France, 1626; d. Toulon, Oct. 24, 1698. A soldier who had served as governor of Thionville, Courcelle in 1665 was appointed governor of New France, which position he held until 1672. In 1666 he led an expedition against the Mohawk Indians who had been annoying the colony by constant attacks. He was forced to retreat because of the severe weather. Later his forces completely subdued the Mohawks, and in 1668 he concluded peace with the Iroquois. Several years later another war was averted when he ordered the execution of three French soldiers who had murdered an Indian chief. He left Canada in 1672 because of poor health, and returned to Paris. Appointed commander of Toulon, he retained that post until his death.

COURCELLES, Etienne de, French Arminian theologian: b. Geneva, 1586; d. Amsterdam, 1659. The son of a French Protestant refugee in Geneva, he was honored as a boy with the friendship of the celebrated Calvinist theologian and church historian, Théodore de Bèze. However, he adopted the Arminian doctrine concerning predestination. His tergiversations caused him to be suspected by both Protestant parties.

COURCELLES, kōōr-sēl', town, Belgium, in Hainaut Province, five miles north-northwest of Charleroi. Its chief industries are the manufacture of glass and iron, and coal mining. Pop. (1947) 16,287.

COUREURS DE BOIS, kōō-rūr dē bwā, or rangers of the woods. During the French regime in Canada, many adventurous Canadian youths, and even soldiers of the regular garrisons, subjected to the vexatious restrictions of a paternal government, took to the woods and lived the free life of the Indians, trading with and frequently marrying among them. This drain on the resources of the colony called for the strongest inhibitions from the representatives of church and state, and amnesties were offered to *couriers de bois* to return and engage in agriculture, but few availed themselves of these offers. They were, however, always loyal to the French interest, and their alliances with the Indians gave them great ascendancy over the savages and kept them friendly to the French power.

COURIER, kōō-ryā', Paul Louis, French writer and pamphleteer: b. Paris, Jan. 4, 1772; d. near Vézetz, April 10, 1825. Educated in military science by the wish of his father, Courier served (1793–1809) in several campaigns of the French Revolution. His chief interest, however, lay in classical studies. In 1810 he published an edition of Longus' *Daphnis and Chloe* (q.v.), taken from a Florentine manuscript, a portion of which had never before been translated. After the Restoration of the monarchy in 1814, Courier began writing a series of political pamphlets opposing the Bourbon government. For his satirical *Simple Discours* he was fined and temporarily imprisoned in 1821. The best of his works in this form was *Pamphlet des pamphlets* (1824), which appeared shortly before he was assassinated by one of his servants near his estate at Vézetz.

His *Oeuvres complètes*, with an essay on his life, were published by Armand Carrel (Paris 1830).

COURIER, kōōr'i-ēr (old French, *courier*, a runner), a bearer of special dispatches, whether public or private (see POST AND POSTAL SERVICE). The term also refers to a guide or attendant for travelers. His function is to facilitate travel by arranging all matters pertaining to passports, luggage, hotel reservations, and money exchange.

COURLAND. See KURLAND.

COURNOT, kōōr-nō', Antoine Augustin, French mathematician, philosopher, and economist: b. Gray, Haut Saône, France, Aug. 28, 1801; d. Paris, March 30, 1877. After teaching at the Academy of Paris (1831–1834) and at Lyons (1834), he made his profession as an educational administrator, serving as rector (1835) and then inspector general (1838) at the Academy of Grenoble and as rector of the Academy of Dijon

(1854–1862). Cournot's principal work, however, was in the field of mathematical probability applied to economic theory. Although he was not the first to use the methods of mathematics in this field, he is considered the founder of mathematical economics and the first to apply the apparatus of supply and demand functions to economic analysis. His most important economic treatise, *Recherches sur les principes mathématiques de la théorie des richesses* (1838), contained the earliest formulation of the modern theory of monopoly and dealt with such economic concepts as duopoly and perfect competition. This work is still highly regarded by students of economic theories.

Cournot's studies in the theory of chance led him to stress the importance of probability calculus for statistics, as well as to outline a philosophy of history in which chance plays a more consequential part than cause. He saw in the advance of civilization the gradual ascendancy of the calculable over the spontaneous and the order of mathematical combinations over the disorder of human life. His writings include *Exposition de la théorie des chances et des probabilités* (1843); *Essai sur les fondements des nos connaissances et sur les caractères de la critique philosophique*, 2 vols. (1851); *Traité de l'enchaînement des idées fondamentales dans les sciences et dans l'histoire*, 2 vols. (1861); *Principes de la théorie des richesses* (1863); *Considérations sur la marche des idées et des événements dans les temps modernes*, 2 vols. (1872); *Matérialisme, vitalisme, rationalisme* (1875); *Revue sommaire des doctrines économiques* (1877).

COURSER, kōr'sēr, one of nine species of birds, so called because of the speed with which they "course" or run over the open steppes and deserts, which are their preferred home. Together with the pratincole (q.v.) they comprise the family Glareolidae, allied to the plovers. They are found in the tropics of the Old World, especially Africa. Coursers are about a foot in length; their sandy or brown plumage matches the desert sands, but they often have conspicuous black bands across the chest. The famed crocodile-bird of the Nile is a somewhat aberrant member of this group.

COURSING, kōr'sīng, the pursuit of running game, such as deer, fox, or rabbit, by dogs, who follow their prey by sight instead of by scent. Coursing was practiced in antiquity and for many centuries was a means of providing meat as well as a popular sport in England, where rules for the judging of greyhounds were first established in the 16th century. By the 19th century, coursing was confined to the pursuit of the hare and had been introduced into America. It still is a popular sport in England, and competition for the Waterloo Cup (begun in 1836) is held annually at Altcar, near Liverpool. In the United States, however, public opinion ruled against the killing of rabbits for the sake of sport, and, in 1919, the invention of the mechanical rabbit inaugurated modern dog-racing methods.

COURT, kōōr, Antoine, French Protestant clergyman: b. Villeneuve-de-Berg, Ardèche, France, May 17, 1696; d. Lausanne, Switzerland, June 13 or 15, 1760. He was one of the most prominent Protestant leaders of his time and is commonly regarded as the restorer of the Reformed Church in France and the founder of

the "Church of the Desert." At the age of 17 he began to address secret assemblies of persecuted Calvinists. Impressed by the fact that the only way to maintain the religion was by organization rather than by the inspiration of zealots, he devoted his life to the building up of regular churches in the various small communities. To this end he summoned a synod of all the preachers in the Cevennes and lower Languedoc at Monoblet. A regular church system and rules were agreed upon. Pierre Corteiz received ordination at Zürich, and by him Court was likewise ordained. Persecutions broke out again in 1724, and Court fled to Lausanne (1730). There he labored incessantly for the founding of a college, of which he was the director and chief pillar for the rest of his life. From this college emanated the pastors of the Reformed Church of France. Court collected documents for a study of Protestantism in France, but his work was not completed and the materials are still preserved at Geneva. His best work is the *Histoire des troubles des Cevennes ou de la guerre des Camisards* (1760; new ed. 1819).

His son, ANTOINE COURT DE GEBELIN (q.v.) who took the name of his grandmother, was a French scholar of note.

COURT, Judicial. In its primary meaning the classical Latin *cohors* (*cors*), whence we derive the term *court*, signified an uncovered space enclosed within a residential curtilage. In the western European languages the derivatives of *cohors* eventually were applied generally to the official residence of a ruler and finally were expanded to include the ruler and the members of his official household, in whom the functions of government—legislative, executive, judicial—were centered. The English word *court* thus came to be used in the sense of a general governing body, such as the High Court of Parliament or the General Court of Massachusetts, the latter consisting of the governor and his council and both branches of the legislature, or as the official designation of a legislature, such as the General Court of Connecticut. Gradually, however, as the judicial function was separated from the others, the term *court*—at least among peoples of the Anglo-American legal tradition—became restricted with increasing exclusion to the institutions entrusted with its exercise.

Sir William Blackstone (1723–1780), the English jurist, defined a court as "a place where justice is judicially administered." Aside from its tautology, the definition is hardly adequate. In the Anglo-American conception a court is more than a place or an individual or a group of individuals. A court, in this view, is rather a functioning organization composed of individuals charged with duties defined by law and assembled at a time and a place fixed by law for the administration of justice.

The means employed by different societies to achieve justice between man and man are among the oldest of social institutions. Sir Henry J. S. Maine (1822–1888) has shown how among primitive peoples judicial awards were made by kings, priests, and rulers, long before custom had developed or legislation had been enacted, and how these awards were assumed to be the result of direct inspiration.

The means for achieving justice vary with the fundamental tenets of the societies in which they appear and with the stages of development which

they have reached. The judicial institutions of democratic differ from those of autocratic, monarchical, or theocratic societies. So also the judicial institutions of secular systems of law, such as the ancient Greek and Roman, and the present Anglican, American, and Chinese, differ from those of systems conceived as divinely revealed. Among the latter are the ancient Egyptian, Mesopotamian, and Hebrew systems, now extinct, and the ancient Hindu and the medieval Mohammedan systems, still in force.

Egyptian.—The first code of which we have any record is that of the Egyptians. By the time of the 4th dynasty (c.2900 B.C.), the king was established as royal theocrat, sole legislator, and judge. He was regarded as having derived from the sun-god Osiris his authority and the law which he administered. He delegated a large part of his judicial power to a chief judge, who by reason of that designation served as prime minister. Under him administrative officials acted as local judges.

Diodorus Siculus describes (*Bibliotheca Historica*, I, 75–76) the native courts as he observed them during the last days of the kingdom before Egypt became a Roman province (30 B.C.). The Egyptians were very solicitous for the character of their courts; only men of the highest standing from the principal cities were chosen as judges. The parties presented their claims and defenses in writing and witnesses were heard. No lawyers were permitted and there was no oratory.

The system continued under the rule of the Greek Ptolemies (323–30 B.C.) until the Roman conquest, when native judges were displaced by Roman officials who applied Roman law but conducted their proceedings in Greek. Seven centuries later came the Arabs, who subjected the Egyptian courts to the religious law of Islam (642 A.D.).

Mesopotamian.—Also conceived as of divine origin was the Code of Babylon. The famous pillar (discovered in 1902) on which this code is engraved also depicts at its head Hammurabi (r. c.1955–c.1913 B.C.), the royal lawgiver, as receiving the law from the hand of the sun-god Shamash. The king was regarded as the fountainhead of justice, rendering his judgments under divine inspiration. Under him, however, the administration of justice passed from the priestly class, who officiated in the temples, to secular judges, who sat at the city gates and in the market places. Litigants could appeal to the prime minister and even to the king himself. (See HAMMURABI, THE CODE OF.) The procedure remained practically unchanged to the time of Darius the Great (r. 521–486 B.C.).

Both in Egypt and in Mesopotamia the keeping of careful records of judicial proceedings made possible the development of a system of case law. Thousands of these records give a vivid and authentic picture of the people's life in these ancient kingdoms.

Hebrew.—Another society claiming the sanction of divine law is that of the Hebrews. We are told that Moses (13th century B.C.) received from Jehovah the two tables of the law "written with the finger of God," and that he "sat to judge the people from the morning unto the evening, because," as he said, "the people come unto me to inquire of God; when they have a matter they come unto me; and I judge between a man and his neighbor, and I make them know the statutes of God, and his laws." But the pressure of the

work compelled Moses to delegate part of his judicial functions to inferior judges, who "judged the people at all seasons; the hard causes they brought unto Moses, but every small matter they judged themselves" (Exodus 18:13-26).

When the Israelites fell upon evil days, "Jehovah raised up Judges who saved them out of the hands of those who despoiled them" (Judges 2:16). But these judges were not so much judicial officers as charismatic leaders of the nation. Deborah, the first female judge, judged the people of Israel, who "came up to her for judgment . . . under the palm tree . . . between Ramah and Beth-el" (Judges 4:5). Samuel was a judge all the days of his life and in his old age made his sons judges. He judged the people in his house at Ramah and "went from year to year in circuit to Beth-el, and Gilgal, and Mizpah" (I Samuel 7:15-8:1).

The astounding victories of Saul made him the hero of the Israelite tribes and raised him to a kind of glorified and regal judgeship (c.1025 B.C.). David also served as king, judge, and military leader (1013-973 B.C.). We are told that when Solomon became king (973 B.C.), Jehovah appeared to him in a dream by night and bade him ask what He should give him. The young king prayed that he might have "an understanding heart to judge the people and that he might discern between good and evil" (I Kings 3:5-9). Jehovah granted his prayer. His handling of the dispute between the two women for the possession of the child of one of them proved to the people that "the wisdom of God was in him, to do justice" (I Kings 3:16-28).

The Greek rulers who ruled Palestine after Alexander's conquest of the East and his death (323 B.C.) gave their Jewish subjects a large measure of self-government. Under them there was instituted the Synhedrion (Heb. Sanhedrin, q.v.), composed of 71 members chosen from the sacerdotal aristocracy and from the schools of religious law. Even under the Roman occupation (from 64 B.C.) the Sanhedrin enjoyed considerable independence as a legislative, executive, and judicial body. Its procedure as the supreme judicial court of the Jews was meticulously guarded and regulated.

Hindu.—Two systems of law, which their adherents claim to be divinely revealed, prevail over wide areas of the world and over large populations. These are the Hindu and the Mohammedan. Indo-Iranians from the northwest poured over the Indian subcontinent (1500-1200 B.C.) and imposed upon the original Dravidian inhabitants their laws, said to have been promulgated by the man-god Manu (q.v.). To these laws King Asoka, who ruled over most of India (273-232 B.C.), added the moral code of Siddhartha Gautama (563?-483 B.C.) known as Buddhism. (See *Buddha* and *Buddhism*.) He decreed that complainants could call upon him at any time and that any dispute or fraud should be brought forthwith to his notice.

After Buddhism had been banned from India (c.800 A.D.), the Buddhistic system continued only in the countries to which Buddhist monks had carried their religion: Burma, Ceylon, Siam, Cambodia, Annam. Buddhist law was exalted to the status of a divine pronouncement in Tibet, where the government still is administered by a priestly hierarchy, at whose head is enthroned the Dalai Lama in Lhasa.

After the banning of Buddhism, the justice

of the ruler in the hundreds of independent states of India under the Brahman (see *BRAHMANISM*) system was personal. He alone had the power of life and death; he could dispose of his subjects' property and persons. When he heard cases, he was attended by learned Brahmans whose presence made his justice divine.

During the centuries of organized and effective Mohammedan rule (1206-1707)—first by the Turks and then by the Mongols—the Brahman law was largely displaced. After India during the 18th century had come under British rule, the old law was restored to its former position of authority (1788) and Hindu pundits advised British judges in all law suits involving Hindus. British district commissioners, thoroughly versed in Hindu law and custom and familiar with the language, visited the villages, administered their affairs, heard complaints, and pronounced judgment in the speedy and personal manner which Orientals so greatly admire. See also *INDIA*, *SUBCONTINENT OF—Law*.

Mohammedan.—The most vigorous of all nomistic systems is the Mohammedan. The law is contained in the Koran, or word of God, as written by Mohammed (570-632, q.v.), in Mohammed's sayings and conduct, as preserved by tradition, and in the treatises of the muftis (jurisconsults). Within little more than a century after Mohammed's death the new faith, known to its adherents as Islam, spread from its Arabian home to India in the east and to Spain in the west. In Granada the Arabs built the Alhambra with its Hall of Justice and Gate of Justice; in Córdoba, the Gate of Pardons. In Córdoba and Seville they established the greatest universities and libraries to be found then in Europe. Education in the law was imparted here and at the universities in Cairo, Isfahan, Damascus, Bukhara, and Stamboul.

By 900, Arab jurists learned to separate the judicial from the executive function and developed a professional body of specialists who organized an elaborate system of legal theory. From the law schools were recruited the judicial officers, of whom the cadis (inferior magistrates or judges) are the best known. The schools also furnished the muftis (jurisconsults), who prepared and submitted opinions on pending cases, counseled clients, and advised on executive and legislative matters.

The Assembly of the Turkish Republic in 1924 adopted a new constitution, abolished the old courts of Islamic law, declared the separation of law from religion, and replaced the old laws with codes founded on Romanesque models. But in many communities from West China and Borneo to Morocco, from the Mediterranean to Kano and Tanganyika, the religious law still holds sway and the cadis continue to administer justice in the mosques and in the market places.

Chinese.—By way of contrast with these nomistic systems is the secular system of the Chinese—a system which probably antedates all those previously discussed and is the world's oldest living system.

For 4,000 years the Chinese were content that all executive, legislative, and judicial powers should be combined in the same officials. At the base of the system was the *chih-hsien* (magistrate of the *hsien*, or county). This official decreed the necessary ordinances for his district, levied and collected taxes, made public improvements, adjudicated disputes, maintained peace and order,

and served as moral guide and censor, frequently admonishing the people subject to his jurisdiction on their duties to heaven, to the emperor, and to each other. Above him were the prefect, the provincial governor, the viceroy, and, finally, the imperial court at Peking. It was essentially a government of men, not of laws. Confucius (c.551-479 B.C., q.v.) emphasized rule by personal example: "Guide the people by law, subdue them by punishment; they may shun crime, but will be void of a sense of right; guide them by example, subdue them by courtesy; they will learn right, and come to good."

In 1911 the overthrow of the last of China's long list of dynasties marked a turning point in Chinese polity. In 1912 a "Provisional Compact" was adopted and a new judicial system was inaugurated. In 1928 new civil and criminal codes were published. In 1936 a Final Draft Constitution of the Republic of China was promulgated and was adopted by the National Assembly in 1947. The Final Draft Constitution defines legislative, executive, and judicial powers, though there is no express prohibition of overlapping. However, since the performance of judicial functions by the district magistrates proved unsatisfactory, a program to relieve them of their judicial functions was undertaken. This was successful in most of the provinces, but how it has fared since 1949, when the People's Government was proclaimed, is unknown.

Greek.—The earliest picture which we have of a judicial proceeding in a secular society is that which Hephaestus wrought upon the shield which he made for Achilles. Homer describes the scene as depicted on the shield (*Iliad*, XVIII, 497-508):

"... a multitude
Was in the market-place, where a strife went on,—
Two men contending for a fine, the price
Of one who had been slain. Before the crowd
One claimed that he had paid the fine, and one
Denied that aught had been received, and both
Called for the sentence which should end the strife.
The people clamored for both sides, for both
Had eager friends; the heralds held the crowd
In check; the elders, upon polished stones,
Sat in a sacred circle. Each one took,
In turn, a herald's sceptre in his hand,
And, rising, gave his sentence. In the midst
Two talents lay in gold, to be the meed
Of him whose juster judgment should prevail."

Apart from conditions at Athens, for which we have good information, too little is known about courts in other Greek city-states, where the system varied from city to city, to warrant more than the statement that juries of citizens eventually superseded the crowds described by Homer.

Aristotle (384-322 B.C.), in his *Constitution of Athens*, tells in detail how Athenian juries were selected in his time. Annually a jury list of all male citizens above 30 years of age was arranged; from this list juries for the different law courts were chosen by lot. For ordinary cases a panel of 500 names was drawn; for more important cases the jury might number 1,000 or even 1,500.

Greek juries were sole judges of both law and fact; the magistrate who presided at a trial had no power to instruct on the law and there was no appeal from the verdicts. The procedure furnished no precedents for the development of a system of case law and produced neither lawyers nor juriconsults, but afforded an unparalleled opportunity for the development of forensic oratory. To it we owe such supreme examples of inspired eloquence as Plato's (*Socrates*) *Apology* (399 B.C.) and Demosthenes' *Oration on the*

Crown (330 B.C.). Since every man was required to conduct and to plead his own cause, the procedure gave rise to a profession of speech-writers, many of whose orations, written for others to deliver, are still studied with profit.

Aristotle remarks that in oligarchies citizens were fined for evading jury service, but in democracies were paid for attendance. In this the citizens of democratic Athens were fortunate: they received three obols (a substantial income) for each case which they heard and they had an opportunity in the market place, in the assembly, or in the courts to indulge in their favorite pastime, "either to tell or to hear some new thing" (Acts 17:21).

Roman.—Since the greatest legacy of ancient Rome is its law, under which—whether pure or blended—almost one half of the civilized world still lives, it is not surprising that of all ancient judicial systems we know most about the Roman procedure as it evolved in its 1,300-year-old ancient history (753 B.C.-565 A.D.). Our information is comparatively full for the period in which Cicero (106-43 B.C.) was the leader of the Roman bar.

Although the administration of the courts for centuries was the peculiar province of those magistrates called praetors (the praetorship, instituted in 367 B.C., by 180 A.D. reached its maximum strength of 19 annually elected members), yet the Romans never insisted on the sharp separation of judicial from executive and legislative functions. Both in the kingdom (753-509 B.C.) and in the empire (27 B.C.-476 A.D. for the west; 1453 A.D. for the east) the king and the emperor performed the chief judicial, executive, and legislative functions, while in the republic (507-27 B.C.) some of the executive magistrates (such as consul, praetor, aedile, censor, plebeian tribune, provincial governor) had judicial duties and the legislative organs (particularly the senate and the centuriate assembly) occasionally acted as courts.

Since it was only infrequently that a magistrate or judge was expert in the law, he was assisted by jurists whose advice he was free to accept or to reject. Such technical advisers (pontiffs until c.250 B.C., juriconsults afterward), whom he himself chose, were called collectively his *consilium*, which in the empire evolved into the emperor's consistory. Many of the interpretations (*responsa*) of these lawyers—whether given to judges or to litigants, for they served private persons as well in all legal activities—attained an authority no less than that of the law itself and eventually were incorporated into Justinian I's (r. 527-565) *Digest*, which received statutory force in 533 A.D.

As the business of the courts increased, a corps of judicial assistants (*apparitores*)—clerks, cashiers, criers, bedels, registrars, messengers—evolved.

In the late empire the state recognized Christian (from 318 A.D.) and Jewish (from 398 A.D.) courts as competent to settle cases in private law brought before such tribunals by adherents to Christianity or to Judaism. Secular execution was accorded to sentences delivered in these courts.

Civil Procedure.—To bring a private law suit to trial the prospective litigants appeared before a magistrate to satisfy him that the case was worthy of a hearing. If their evidence convinced the magistrate (usually a praetor) that the suit

was admissible, the litigants were offered the choice of alternatives: trial either by a single judge (or at most five referees) or by a panel of jurors numbering 105 (later 180). When this choice had been made, the magistrate then determined the nature of the claim, fixed the conditions under which the case should be heard, and sent the suit to the chosen judge or jury for trial.

The judges were popular referees, selected by the litigants from a list of citizens compiled by the principal (urban) praetor. Like the magistrate himself, these judicial delegates were not necessarily trained in the law, but were free to seek the advice of juriconsults. Three types of people's judges are distinguished: (1) the *iudex* heard cases in which a fixed sum was claimed or could be awarded as a penalty; (2) the arbiter tried suits wherein an indefinite amount would be assessed by an estimate of circumstances; (3) the *recuperatores* (always three or five) were used originally (before 242 B.C.) in cases to which aliens against citizens or against aliens were parties, but later also in cases in which citizens desired speedy settlements of compensation or of restitution. These judges sat singly (save for the *recuperatores*), ruled on admissibility of testimony and of evidence, and pronounced judgment.

Criminal Procedure.—Suits involving crimes and acts affecting adversely public policy, welfare, and security were tried in Cicero's generation in one or another of 10 so-called standing courts (*quaestiones perpetuae*), over which praetors presided and in which jurors served.

As in civil procedure, the first step was to request a magistrate (usually a praetor) to permit the action to be brought, for there never was a public prosecutor in Rome and it was left to aspiring politicians or to patriotic barristers to prosecute persons suspected or known to have committed crimes. If more than one accuser appeared for a single offense, a preliminary oratorical argument, wherein each aspirant attempted to prove his prowess, entertained the jurors, before whom the case later would be tried and who theoretically voted for the best candidate in the contest.

The urban praetor annually arranged a jury list of about 1,000 names of upper-class citizens, who were divided into panels of uncertain (to us) strength. From these panels, assigned in rotation to courts, were selected by lot more jurors than would be needed for a given case, that enough after challenge might remain to hear the suit. Voting could be open or by ballot. Three possible verdicts were: (1) not proved, (2) acquittal, (3) condemnation. A two-thirds vote was necessary to find the first verdict, but a majority of votes decided the last two verdicts; a tie vote resulted in acquittal. See CIVIL LAW.

Germanic.—The administration of justice among the Germanic tribes, as described by the Roman historian Tacitus in his *Germania* (98 A.D.) was secular. A tribe's general assembly selected chiefs, each aided by 100 assessors (*Schöffen*), to administer law in villages. The assembly apparently heard only criminal cases, in which the guilty either received a capital penalty or paid a fine in livestock.

The Germanic invaders imported this procedure into Gaul (France), whose Romanized inhabitants for the most part continued to live under Roman law as they had known it. The Merovingian kings of the Franks (481-742) favored their subjects by imitating Roman ways to

the extent of even sitting to adjudicate law suits. Dagobert I (r. 628-638), the most powerful of the Merovingians, took an active part in the administration of justice.

The later Merovingian kings divided the country into counties, over which they appointed officials known as counts. These served not only as executives and administrators, but also as judges over both Franks and Gallo-Romans. In the exercise of their judicial functions they were assisted by lay judges (*Schöffen*).

Charlemagne (r. 768-814) sent out special judges (*missi regii*) to hold assizes in the various districts of his empire and to inquire into maladministration of justice.

French.—After Charlemagne's death his centralized empire disintegrated into a myriad of feudal fragments. The administration of justice passed into the hands of feudal lords of three different grades of jurisdiction (high, middle, low, of which the high alone possessed the power of life and death). The law differed from barony to barony, but knowledge of the law was not regarded as indispensable and issues of fact were frequently ordered tried by combat.

Philip Augustus (r. 1180-1223) undertook the task of reintegrating the feudal fragments. He established royal courts of justice in his own feudal domains and in every barony on its reunion to the crown. Certain cases, designated royal, were withdrawn from baronial courts. In every case, unless the defendant objected, the royal court proceeded to exercise jurisdiction. Louis IX (r. 1226-1270) promulgated the code known as the Establishments, which fixed procedural rules. Appeals lay to the supreme council (court of peers), whose members in the following century were mostly men learned in law. By the end of the reign of Louis XV (r. 1723-1774) there were 13 parliaments and 4 provincial councils, which pronounced royal judgments in civil and criminal cases, and more than 300 courts of first instance. The Constituent Assembly abolished (1791) the parliaments and the old royal courts and in their place created for each department of France a criminal court with a jury, for each district a civil court, and for the whole kingdom the Court of Cassation over these courts of first instance.

Anglican.—The Jutes, the Angles, and the Saxons, who invaded England, after the Roman legions had been withdrawn (410 A.D.), brought with them their Germanic traditions, customs, and institutions. As the tribal communities which they established became united in kingdoms—(at one time there were seven kingdoms—the Heptarchy—in the island), new districts, known as shires, midway between the administrative and judicial unit of the hundred and the folkmoor of the kingdom, were created. After the several tribal kingdoms had been united into one kingdom the shiremoot, later known as the county court, exercised a general jurisdiction and was also the governing authority of the shire.

The only royal and national court was the Witenagemot (q.v.), over which the king presided, but it was accessible only to nobles and to those who had resorted to the moots of hundred or of shire and had been denied redress. Besides being a judicial tribunal the Witenagemot exercised legislative, executive, and administrative functions. Jury trial was unknown. Issues of fact were tried by the ordeals of hot iron, where the suspected person was a freeman, or of boiling

water, where he was a villein, or by compurgation, wherein a party obtained oath-helpers (usually 12 in number) to swear either to the truth of his plea or merely to their belief that he had sworn to the truth. The judicial system of Anglo-Saxon England thus was characterized by decentralization.

After the Norman Conquest (1066 A.D.) the new king, William I (r. 1066-1087), substituted the *Curia Regis* (q.v.) for the Witenagemot as a general executive, legislative, and judicial body. He also added trial by battle to the Anglo-Saxon procedures. Under him and his successors, particularly Henry II (r. 1154-1189), the judicial system was centralized, with the king at its head. The *Curia Regis* followed the king's person, but with the completion of Westminster Hall as the king's palace in 1099, the *Curia Regis* had a definite abode, and after 1300 (for nearly 600 years) Westminster Hall served as the central seat of justice for the realm. *Magna Charta* (1215), indeed, stipulated that legal suits should no longer follow the ambulatory royal court, but should be tried in some fixed place.

From the *Curia Regis* were evolved the central courts of original jurisdiction: (1) the Court of Exchequer, organized c.1118; (2) the Common Pleas, originally known as the Bench, or Common Bench, created in 1178; (3) the King's Bench, instituted in 1268.

Court of Exchequer.—This court originally was concerned only with the royal revenues, but in time its jurisdiction was extended to all actions between subjects except those involving claims concerning lands. This was accomplished by permitting a plaintiff to plead that he was indebted to the king and that the defendant was withholding what he owed him (the plaintiff) by reason whereof he was less able to pay the king. Upon such an allegation, of which no denial was permitted, the plaintiff could sue out a writ of *quominus* and bring his adversary into the king's court.

Court of Common Pleas.—Sir Edward Coke (1552-1634), who in 1606 became lord chief justice of the Common Pleas, declared that court to be "the lock and key of the common law." He fought valiantly for its independence and power against what he considered to be the encroachments of the Court of Chancery, the Court of King's Bench, the ecclesiastical courts, and the royal prerogative. The Common Pleas was the great court of original jurisdiction in civil actions, both real and personal, between subjects.

Court of King's Bench.—The King's Bench was the great criminal court. It also had jurisdiction of all pleas of the crown, civil actions involving force or in which the king was plaintiff, and actions of replevin. It finally exercised an appellate jurisdiction over the other two common law courts.

Trial by Jury.—The characteristic feature of common law trials was the jury. This important institution probably had its origin in the administrative practice in parts of France (with which the Norman kings of England were familiar), whereby men of the vicinage were called to declare on oath their knowledge as to certain matters, such as ancient landmarks, family history, and kinship. Later a select number was substituted for the community; these gave their testimony on oath and were called the *jurata*. A jury was thus in origin a group of sworn witnesses and it continued in this character for sev-

eral centuries. This institution, obscure in its origin, has become the prized palladium of civil liberties and rights wherever the Anglican system has spread.

The United States Constitution guarantees trial by jury in criminal cases by the 6th Amendment and in civil cases by the 7th Amendment. Most state constitutions contain similar guarantees.

In France there was no trial by jury until 1791; in that year an act of the Constituent Assembly gave the right of such trial in criminal cases. This was preserved in the *Code Napoléon* (1804); at the same time the code provided for the selection of jurors by means largely under the executive's control or influence. Other countries followed the example of the code, but in none of them does the jury occupy so important a place as in the Anglo-American systems. Today the only court in France which sits with a jury is the *Cour d'Assises*, before which major offenses (*crimes*) are tried.

Other Courts.—The courts which have been described did not, however, exhaust the well springs of royal justice, and from time to time other courts were established to supplement the common law justice. Among such courts, created in the exercise of the royal prerogative, are the Court of Chancery, the Court of Star Chamber (abolished 1641), the Courts of Admiralty, and the ecclesiastical courts following the Reformation.

Ecclesiastical Courts.—In England during medieval times—as in most of the countries of western Europe—the church had its own ecclesiastical courts. These constituted a complete judicial system in themselves. From judgments in diocesan and archdiocesan courts appeal lay to the Roman Curia. These ecclesiastical courts administered a law of their own, the canon law, derived in part from Roman law. They had jurisdiction to enforce discipline within the church and religious orders and over spiritual offenses by laymen. Ultimately they acquired jurisdiction over marriage, divorce, probate of wills, and administration and settlement of estates.

William I and his successors in England claimed that appeals from the ecclesiastical courts within the realm properly lay to the sovereign as the supreme authority in spiritual as well as in temporal matters—a claim which the church vigorously combatted, with the result that King John in 1213 was compelled to acknowledge the supremacy of the pope. But the struggle did not end there. The statutes of *praemunire* (27 Edward III, St. 1, c.1 [1353]; 16 Richard II, c.5 [1392-1393]) imposed severe penalties upon resort to Rome in derogation of the jurisdiction of common law courts. After Henry VIII had broken with Rome, Parliament passed the Act of Appeals (1533) providing that all spiritual cases should be determined within the king's jurisdiction and not elsewhere. Otherwise the structure and jurisdiction of the ecclesiastical courts was little changed until 1857, when jurisdiction over annulment and divorce *a mensa et thoro* was vested in the Court for Divorce and Matrimonial Causes, and in probate matters in the Court of Probate (20 and 21 Victoria, c.77). The Judicature Act of 1873 (36 and 37 Victoria, c.66) and the Supplemental Judicature Act of 1875 (38 and 39 Victoria, c.77) vested this jurisdiction in the Probate, Divorce, and Admiralty Division of the High Court of Justice.

Other European countries followed the English example. In France a series of statutes curtailed the jurisdiction of the ecclesiastical courts, until the National Assembly (1790) abolished such courts. Today the Roman Curia in its several congregations and tribunals exercises final jurisdiction only in matters of faith and morals affecting the clergy (both secular and regular) and the laity of the Roman Catholic Church.

Court of Chancery.—The chancellor was originally an executive, the chief official of the Exchequer. As lord keeper of the Great Seal, which was required to authenticate all state documents, he controlled the issuance of writs which were required to start the wheels of justice moving in the courts of Exchequer, Common Pleas, and King's Bench. However, by the reign of Edward II (1307-1327) he was exercising judicial functions and by 1350 his office had developed into the Court of Chancery—a court which by reason of the royal prerogative could afford relief above and beyond the competence of the common law courts. Unlike the common law courts, which functioned only in regular terms, the Court of Chancery was always open. Upon the filing of the bill setting forth complainant's grievance—and no charge was made for filing—a subpoena was issued directing the respondent to appear and answer upon oath complainant's allegations. The chancellor heard the case without a jury and passed on all questions of law and fact. The judgment was known as a decree—a personal command that the respondent do, or refrain from doing, specified things.

Courts of Admiralty.—In the 14th century the king began to appoint admirals, who soon began to exercise judicial powers. Early in the next century a single lord high admiral of England was appointed and a prerogative court of admiralty jurisdiction was established in London. With the Age of Discovery, the exploits of English buccaneers on the Spanish Main, and the presence of English shipping on all the Seven Seas, the power and prestige of this court increased, until it encountered the opposition of the common law courts. During the 17th century it suffered an eclipse, but, with the Industrial Revolution and the increased importance of overseas commerce in the 18th and 19th centuries, it regained its former jurisdiction.

Appellate Courts.—The ultimate appellate authority is the House of Lords. Until 1844 each member of the House was a judge, but in that year the famous case of *Daniel O'Connell v. the Queen* established the rule that only law lords (that is, those holding or having held high judicial office) should vote as judges, and this has ever since been the practice.

Privy Council.—By the Judicial Committee Act of 1844, Parliament gave statutory recognition to the prerogative authority of the Judicial Committee of the Privy Council to hear appeals from any court of justice of the British colonies and possessions. Later acts, however, have tended to limit such appeals to those from the highest courts of the several provinces or states or dominions. The tendency has been for the commonwealths to limit or to abolish such appeals.

Procedural Reform.—As is true of all institutions when the creative impulse has exhausted itself, the Anglican system of common law and chancery procedure, like an ocean-going craft, gathered barnacles with the years. Common law pleading became more technically evasive and

dilatory; an action began with the declaration in which the plaintiff couched his claim in approved legal jargon, but this was followed by interminable other pleadings designed, theoretically, to entrap that elusive concept, the issue; thus there followed the plea, the replication, the rejoinder, the surrejoinder, the rebutter, and the surrebutter.

By contrast, at its inception, the chancery practice seemed simple indeed. This circumstance encouraged resort to the chancery court and the chancellor was swamped with business. This necessarily retarded his work and by the 1800's the accumulation of arrears was such that it took years to get a suit through the court. Charles Dickens (in 1852) published his *Bleak House*, in which he satirized the chancery practice by portraying the case of Jarndyce and Jarndyce "with its bills, cross-bills, answers, rejoinders, and the mountains of costly nonsense that had accumulated on it." Meanwhile, as Dickens says, innumerable children had been born into the case; innumerable young people had married into it; innumerable old people had died out of it—and no one knew what the case was about or who the real parties were; no one had ever seen them.

Even before Dickens had written his *Bleak House*, the cumbersomeness of the dual system of courts of law and equity and the inadequacies and abuses of the procedures of these courts challenged the attention of publicists, members of Parliament, and royal commissions. The Field Code of Procedure (discussed later) pointed the way and some reforms were introduced, but it was not until 1869 that a complete overhauling of the judicial system was seriously considered. In that year the Royal Judicature Commission reported that "the first step towards meeting and surmounting the evils complained of would be the consolidation of all the courts of law and equity into one court, in which would be vested all the jurisdiction exercisable by each and all the courts so consolidated." Parliament passed the Judicature Act of 1873 and then the Supplemental Judicature Act of 1875, which abolished the old courts and substituted a Supreme Court of Judicature, consisting of the High Court of Justice and the Court of Appeal. Since the Act of 1881 the High Court of Justice has functioned in three divisions: (1) Chancery, (2) King's Bench, (3) Probate, Divorce, and Admiralty.

United States.—The British colonists brought with them to America the common law as they had known it and also modified replicas of the judicial system of England. Separate courts of law and of chancery were established in all the colonies, though in Massachusetts and Pennsylvania the discretionary jurisdiction of the chancellor was so repugnant to the Puritan and Quaker concepts of a justice of law rather than of men that those colonies early rejected both the chancery court and its jurisdiction. It was not until 1836 and 1877 that equity jurisdiction was adopted in Pennsylvania and in Massachusetts, respectively. Although all jurisdictions in the United States now recognize equity as a fundamental element in their jurisprudence, only a minority of the states retain the separate chancery courts.

State Courts.—After the separation from the British crown (1776) the colonial courts became courts of the several states without any great changes in jurisdiction, procedure, or even personnel. Decisions of English courts continued

to be cited by United States judges and lawyers and the treatises of English jurists furnished the basic study for aspirants to the bar. But with these benefits were associated some of the very evils which were developing in the English dual system of courts of law and equity. Soon after his admission to the bar of New York, David D. Field (1805-1894) became convinced of the need for reform and thereafter devoted himself unremittingly to the task of interesting members of the bar, civic organizations, and legislative committees in the project. In 1847 he was appointed head of a state commission to revise the practice and procedure of the courts of New York. In 1848 the commission reported a code of procedure (enacted into law in the same year), which substituted for the old dual system one in which law and equity were administered by the same courts and under a common and simplified procedure. The code, known as the Field Code of Procedure, has since been adopted with modifications by most of the states of the Union.

The judicial systems of the several states present, generally, a common pattern. At the first tier of the judicial hierarchy are inferior courts of limited jurisdiction, such as the courts of justices of the peace, municipal courts, and recorders' courts. Above these are courts of general jurisdiction variously designated, in the different states, as courts of common pleas, circuit courts, or superior courts, and in New York as the supreme court. Above these are courts of intermediate or final appellate jurisdiction, the latter generally known as supreme courts. Probate and testamentary matters and matters involving testamentary trusts are handled by courts variously designated probate, surrogate, or orphans' courts.

The most significant development in the United States judicial system in recent years has to do with children. On July 1, 1899, there went into effect a statute of Illinois which established in Chicago the first juvenile court in the world. This law revolutionized the treatment of delinquent and neglected children. Dean Roscoe Pound declared the inauguration of the Chicago court to be "the greatest advance in judicial history since Magna Charta." In 1899 Judge Ben D. Lindsey organized in Denver, Colo., under a school law, a juvenile court and in 1903 secured the passage of a juvenile court act similar to that of Illinois and also of an act giving the juvenile court jurisdiction to deal directly with parents and other adults contributing to delinquency or dependency under either chancery or criminal procedure. He continued to be for many years a protagonist of the juvenile welfare movement. Today every state in the American Union has a juvenile court law and such laws exist in more than 30 foreign countries, though many of them are limited and imperfect.

Federal Courts.—The Constitution (Art. 3, sect. 2) defines in nine categories of cases and controversies the extent of the judicial power of the United States. Congress cannot confer jurisdiction beyond the extent of the power so defined nor can a federal court exercise jurisdiction beyond what Congress confers within the limitations of the Constitution. All federal courts are, therefore, courts of limited jurisdiction.

Article 3, section 1, created the Supreme Court, though it left its membership and organization to Congress. The Judiciary Act of 1789

provided for a chief justice and five associate justices. Since then, at different times, the number of associate justices has been 6, 8, and 10. The Act of April 10, 1869, fixed the number of associate justices at eight, and that has been the number ever since.

Article 3, section 2, provided that in all cases affecting ambassadors, other public ministers, consuls, and those in which a state shall be a party, the Supreme Court should have original jurisdiction and that in all other cases it should have appellate jurisdiction, with such exceptions and under such regulations as Congress should make. The Supreme Court now has jurisdiction of direct appeals from judgments of district courts holding an act of Congress unconstitutional; from decisions of district courts granting or denying, after notice and hearing, an interlocutory or permanent injunction in any civil action required by act of Congress to be heard and determined by a district court of three judges; from decisions of courts of appeals holding invalid a state statute as repugnant to the Constitution, treaties, or laws of the United States; from judgments of the highest courts of the several states when declaring invalid a treaty or a statute of the United States, and from final judgments upholding the validity of state statutes against the contention of repugnancy to the Constitution, treaties, or laws of the United States. Other cases reach the Supreme Court only as a matter of grace, that is, upon the allowance by the court of what is called a petition for a writ of certiorari directed to the lower court.

The Judiciary Act of 1789 divided the territory embraced in the states into 13 districts, organized in 3 circuits. It provided a circuit court and a district court for each district, the former presided over by two justices of the Supreme Court sitting with the district judge. The district court was presided over by the district judge alone. Since this work on the circuits proved very burdensome to the justices, subsequent statutes relieved them of a large part of their circuit duties. Finally the Circuit Court of Appeals Act of March 3, 1891, relieved the justices of all trial work. The Act of March 3, 1911, abolished the circuit courts and transferred their jurisdiction to the district courts. In 1952 there were 85 district courts within the continental United States.

The Circuit Court of Appeals Act (1891) provided an intermediate tier of appellate courts between the circuit and district courts and the Supreme Court. It divided the country into nine circuits, in each of which it created a court of appeals consisting of three circuit judges. The circuits were increased to 10 in 1929 and to 11 in 1948.

The procedure in actions at law in the federal courts, beginning with the Temporary Process Act of 1789 and until Sept. 1, 1938, generally conformed to the procedure of the courts of the state in which they sat. Suits in equity, however, were governed by equity rules promulgated from time to time by the Supreme Court. The English separation of law and chancery was thus perpetuated, although the same judge heard both classes of cases.

On June 19, 1934, Congress passed an act (48 Stat. 1064) authorizing the Supreme Court to prescribe uniform rules of procedure for both actions at law and suits in equity. The court

appointed an advisory committee to assist in drafting the rules. A complete set of rules was reported to Congress on Jan. 3, 1938, and, there being no objection by Congress, the rules, known as the Federal Rules of Civil Procedure, went into effect on Sept. 1, 1938. They are framed largely along the lines of the English rules under the judicature acts of 1873 and 1875. A new title 28 of the United States Code, under the heading "Judiciary and Judicial Procedure," became effective Sept. 1, 1948 (62 Stat. 869). On the same day a new title 18 of the code, under the heading "Crimes and Criminal Procedure," also became effective (62 Stat. 684).

Besides the Supreme Court, the courts of appeals and the district courts—generally referred to as "constitutional courts"—there are (1) the United States Court of Claims, having jurisdiction of claims against the United States; (2-3) the Customs Court and the Court of Customs and Patent Appeals: the former with jurisdiction of cases involving customs laws and regulations, the latter with jurisdiction by appeal from judgments of the Customs Court and from decisions of the Patent Office; and (4) the Tax Court, having jurisdiction of cases under the internal revenue laws.

Courts-martial; Military Commissions and Tribunals.—Members of the armed forces of a state are subject to the articles of war promulgated by that state and for their infraction may be tried by courts-martial or by military commissions convened in the manner and pursuant to the procedure which the state has prescribed. Enemy combatants guilty of violations of the common law of war are tried by military commissions in accordance with that law.

On Aug. 8, 1945, the governments of the United States, France, the United Kingdom, the Union of Soviet Socialist Republics entered into an agreement for prosecution and punishment of the major war criminals of the European Axis. Annexed to the agreement was the charter of the International Military Tribunal setting forth its constitution, jurisdiction, power, and procedure. Twenty-two major Nazi war criminals were tried before the tribunal—the first time in history that legal proceedings had been instituted against the leaders of an enemy nation.

International Courts.—The increasing use of arbitration in the settlement of international disputes was an important development of the 19th century. The outstanding example was the Alabama Claims Arbitration (1872) involving demands on the part of the United States arising from alleged violations of neutrality by Great Britain during the Civil War. It resulted in a decision requiring Great Britain to pay to the United States the sum of \$15,500,000.

The First Peace Conference (at The Hague in 1899) adopted a convention on the pacific settlement of international disputes which codified the law and practice relating to good offices, mediation, and arbitration, and provided for a Permanent Court of Arbitration. The Second Peace Conference (at The Hague in 1907) revised the convention and provided a panel of eminent jurists from which a court might be selected to arbitrate any dispute between signatories of the convention.

Since these arbitral tribunals were not courts in the proper sense, the Versailles Peace Conference of 1919 decided that a Permanent Court of International Justice should be established, but

left to the Council of the League of Nations the details of its creation. The court held its first session at The Hague in 1922 and until the invasion of the Netherlands in 1940 had heard 65 international cases, rendered 32 judgments, 27 advisory opinions, and issued over 200 orders.

The United Nations came into being on Oct. 24, 1945, when its charter, drafted and signed at the United Nations Conference on International Organization at San Francisco from April 25 to June 26, 1945, had been ratified by a majority of the signatory states. The charter established as one of the principal organs of the United Nations an International Court of Justice. Only states can be parties to cases before the court. This compulsory jurisdiction of the court has been accepted by 37 states.

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GUSTAVUS OHLINGER.

COURT, Presentation at, a formal presentation to the sovereign of Great Britain of persons whose official, social or intellectual standing entitles them to that honor. It takes place either at St. James's Palace, at a levee, intended for gentlemen only, or at Buckingham Palace, a drawing room, where both ladies and gentlemen appear. The days when levees and drawing rooms are to be held are always announced some time beforehand. It is difficult in the present day to define exactly who may and who may not be entitled to be presented. Members of families of the nobility, diplomats, members of the House of Commons, persons holding high offices under the crown, judges, magistrates, church dignitaries, officers in the army and navy, persons who have attained eminence of any kind, foreign ambassadors, members of their staffs and strangers of distinction, and the wives and daughters of the same classes, form the larger number of those presented at levees and drawing rooms. Persons are often presented on entering on some office or attaining some dignity. Any one who has been once presented is entitled to appear at any future levee or drawing room without a new presentation. The whole arrangements connected with presentations are under the supervision of the lord chamberlain, in whose office in St. James's Palace information is given to all persons wishing to be presented. The names of ladies and gentlemen desiring presentation, and of the ladies, noblemen and gentlemen who are to present them, have to be submitted to the sovereign for approval and there is a strict exclusion of persons of damaged reputation, whatever their rank. Court dress or official uniform must be worn. A British subject who has been presented at St.

James's may on any after occasion claim to be presented by the British minister at any foreign court.

COURT BARON, a tribunal originated in medieval England and operated by the lords of manors. This type of court, although feudal in origin, was an important institution in local English government as late as the 16th century and was still alive, though decadent, in the latter part of the 17th century. It declined rapidly in the 18th century, when personal actions initiated in such courts were generally transferred to the courts of common law. The court baron had jurisdiction over matters affecting the lord's rights and the community at large. Personal actions, such as suits for breach of contract, trespass, libel, slander, and assault could be tried there, if the amount involved was 40 shillings or less.

COURT CEREMONIAL, certain forms of international etiquette or usage, which have arisen in Europe during modern times. No independent state can actually have precedence of another; but as the weaker seek the protection and friendship of the more powerful, there arises a priority of rank. The origin of elaborate formalities is to be traced to the Eastern nations, which for ages have practiced various forms expressing reverence for exalted personages. By a gradual establishment of dignities, rank and acts of respect to states, their rulers and representatives, an international ceremonial was formed, that was sometimes the source of confusion and war; to its observance far more consideration was often paid than to the fulfillment of the most sacred contracts. Louis XIV carried this folly further, perhaps, than anyone before or after him. To this international ceremonial belong:

1. Titles of rulers. Accident made the imperial and regal titles the highest, and thus conferred advantages apart from the power of the princes. After Charlemagne, the emperors of the Romans were considered as the sovereigns of Christendom, maintained the highest rank, and even asserted the dependence of the kings on themselves. For this reason several kings in the Middle Ages, to demonstrate their independence, likewise gave their crowns the title of "imperial." The kings of France received from the Turks and Africans a title equivalent to emperor of France. In progress of time the kings were less willing to concede to the imperial title, of itself, superiority to the royal.

2. Acknowledgment of the titles and rank of rulers. Formerly the popes and emperors arrogated the right of granting these dignities; but the principle was afterward established that every people could grant to its rulers a title, the recognition of which would rest on the pleasure of other powers and on treaties. Some titles were therefore never recognized, or not till after the lapse of considerable time. This was the case with the royal title of Prussia, the imperial title of Russia, and the new titles of German princes.

3. Marks of respect conformable to the rank and titles of sovereigns. To the "royal" prerogatives, so-called (conceded, however, to various states which were neither kingdoms nor empires, such as Venice, the Netherlands, Switzerland, and the electorates), pertained such rights as that of sending ambassadors of the first class.

In connection with this there is a much contested point: that of precedence or priority of rank, that is, of the right of assuming the more honorable station on any occasion, either personally, at meetings of the princes themselves, or of their ambassadors, at formal assemblies, or by writing, as in the form and signature of state papers. There is never a want of grounds for supporting a claim to precedence.

As the councils in the Middle Ages afforded the most frequent occasions of such controversies, the popes often intervened. Of the several arrangements of the rank of the European powers which emanated from the popes, the principal is the one promulgated in 1504 by Julius II, through his master of ceremonies, in which the European nations followed in this order: (1) the emperor of the Romans (emperor of Germany); (2) of Rome; (3) of France; (4) the king of Spain; (5) of Aragon; (6) of Portugal; (7) of England; (8) of Sicily; (9) of Scotland; (10) of Hungary; (11) of Navarre; (12) of Cyprus; (13) of Bohemia; (14) of Poland; (15) of Denmark; (16) Republic of Venice; (17) duke of Bretagne; (18) of Burgundy; (19) elector of Bavaria; (20) of Saxony; (21) of Brandenburg; (22) archduke of Austria; (23) duke of Savoy; (24) grand duke of Florence; (25) duke of Milan; (26) of Bavaria; (27) of Lorraine. This order of rank was not, indeed, universally received, but it contained a fruitful germ of future quarrels; some states, which were benefited by the arrangement, insisted upon its adoption, and others, for opposite reasons, refused to acknowledge it. To support their claims for precedence the candidates sometimes relied on the length of time which had elapsed since their families became independent, or since the introduction of Christianity into their dominions; sometimes on the form of government, the number of crowns, the titles, achievements, and extent of possessions, pertaining to each. But no definite rules have been established by which states are designated as being of the first, second, third, or fourth rank. Rulers of equal dignity, when they make visits, concede to each other the precedence at home; in other cases, where the precedence is not settled, they or their ambassadors take turns until a compromise is effected in some way. The "we," by which monarchs style themselves, is used either from an assumption of state or from a feeling of modesty, on the supposition that "I" would sound despotic, while "we" seems to include the whole administration.

COURT DE GEBELIN, kōōr dē gā'blān', Antoine, French scholar, only son of Antoine Court (q.v.); b. Nîmes, France, Jan. 25, 1725; d. Paris, May 10, 1784. He studied theology at Lausanne, and became a pastor of the Reformed Church, but he abandoned the calling for literary pursuits and settled in Paris after 1760. He published *Les Toulousaines, ou lettres historiques et apologetiques en faveur de la religion reformée* (1763), in defense of his co-religionists. In support of American independence he did work for the periodical *Affaires de l'Angleterre et de l'Amérique* (1776 et seq.). His comprehensive study of the languages and mythologies of the ancient world, *Le Monde primitif analysé et comparé avec le monde moderne . . .* appeared in nine volumes published between 1773 and 1784; it was unfinished at his death.

COURT OF APPEALS. See COURT; UNITED STATES—*The Judicial System*.

COURT OF APPEALS IN CASES OF CAPTURE (1780-1787), the chief federal court prior to the establishment of the Supreme Court of the United States. The Articles of Confederation gave Congress "sole and exclusive right and power . . . of appointing courts for trial of piracies and felonies committed on the high seas and establishing courts for receiving and determining finally appeals in all cases of capture, provided that no member of Congress shall be appointed a judge of any of said courts." Congress was also given power to set up *ad hoc* tribunals to settle disputes between the states or between individuals arising out of land grants from different states (Art. IX).

These provisions constituted precedents for the Supreme Court established by the Constitution to remedy what Hamilton called a major defect of the Confederation, the want of a judiciary power (*The Federalist*, 22). This judgment was justified in regard to disputes between the states. Of six such disputes submitted to the Continental Congress, in only one (*Pennsylvania v. Connecticut*) was judgment given, and that did not prevent hostilities between claimants in the territory in question in northern Pennsylvania. The others were finally settled by agreement. In regard to the trial of piracies and felonies committed on the high seas, Congress merely authorized courts of the states to assume jurisdiction. In regard to appeals in cases of capture, the record was somewhat better.

Even before the Articles of Confederation went into force, and even before the Declaration of Independence, disputes had arisen over claims by privateers with commissions from different states or from the Continental Congress. On Nov. 11, 1775, Washington wrote to the president of Congress, "should not a court be established by authority of Congress to take cognizance of prizes made by the Continental vessels?" On Nov. 25, 1775, Congress recommended that the colonies set up prize courts, reserving appeals to itself or to such committees as it might establish. The first appeal was in the case of the schooner *Thistle* on Aug. 5, 1776. Congress at first attempted to deal with the case itself, but finally referred it to a committee of seven, which reversed the condemnation on Sept. 19, 1776. Washington continued to urge that a real court was necessary with adequate jurisdiction. It appears that many of the states had established prize courts, but had greatly limited appeals to Congress. On Jan. 30, 1777, Congress established a standing committee of five to hear appeals in these cases, the members being James Wilson of Pennsylvania, Jonathan Sargent of New Jersey, William Ellery of Rhode Island, Samuel Chase of Maryland, and Roger Sherman of Connecticut. Soon after, James Wayne of New York, John Adams of Massachusetts, and Thomas Burke of North Carolina were substituted for the last three. There continued to be a rapid turnover, and the inadequacies of the committee's authority were obvious, especially in the case of the sloop *Active*. This vessel, captured by the British, was recaptured by the crew and adjudicated by a jury in a Pennsylvania court which divided the proceeds from the sale of the vessel and cargo among several claimants. On appeal, the com-

mittee of Congress reversed the judgment, but the Pennsylvania court ignored this, on the theory that a finding of facts by a jury was definitive. In a resolution of March 6, 1779, Congress declared that captures were to be decided by the law of nations, which is within the power of making war and peace vested in Congress, and called upon the Pennsylvania court to carry out the decision of the committee. This resolution was also ignored, and the appellants did not gain relief until Congress dealt with the matter in 1809 (*U.S. v. Peters*, 5 Cranch 115). The committee thereafter refused to hear further cases.

Congress hesitated to set up a court until the Articles of Confederation went into force. Not until Jan. 14, 1780, when that was assured, did it establish the Court of Appeals in Cases of Capture, with three judges, the first real federal court. There was to be no jury and it was to judge in accordance with "the usages of nations." George Wythe of Virginia, William Paca of Maryland, and Titus Hosmer of Connecticut were appointed judges. Cyrus Griffin was immediately appointed in place of Wythe, who declined to serve. Members of Congress were frequently appointed to the court but, preferring to retain their places in Congress, always resigned before serving, in accordance with the provisions of the Articles.

The court held sessions in Hartford, New York City, Richmond, and Philadelphia. In 1784 Congress considered abolishing the court, as it seemed to have little business since war was over. But this was not done, and the court continued to function until 1787. Prior to its establishment 64 cases had been submitted to congressional committees; 11 of these were decided by the court, which also dealt with 45 other cases. Thus a total of 109 prize cases were considered in the pre-Constitution period, the last being the case of the *Sloop Chester v. the Brig Experiment*, decided on May 1, 1787 (2 Dall. 41). Only eight of these cases have been reported, of which the most important were *Miller v. the Resolution*, 1781 (2 Dall. 1, 19), and *Darby v. the Brig Eastern*, 1782 (2 Dall. 34). These asserted important principles of prize law, such as the necessity of transferring captured neutral property in prize adjudication, the superiority of international law over municipal law in prize cases, and the need of finding evidence to condemn in the vessel itself and its papers.

It is interesting to notice that, as there was a precedent for the Supreme Court of the United States in a federal prize court, so a precedent for the World Court, established in 1920, was found in the International Prize Court provided for by one of the Hague Conventions of 1907, but never actually established.

Consult Davis, J. C. Bancroft, "Federal Courts Prior to the Adoption of the Constitution," *United States Reports*, vol. 131, pp. xix ff. (New York and Albany 1889).

QUINCY WRIGHT,
Professor of International Law, University of Chicago.

COURT OF CHANCERY. See COURT, JUDICIAL; GREAT BRITAIN—28. *Judicial System*.

COURT OF CLAIMS. See COURT, JUDICIAL; UNITED STATES—*The Judicial System*.

COURT OF CUSTOMS AND PATENT APPEALS, U.S. See COURT, JUDICIAL.

COURT OF HIGH COMMISSION, a court which was established in the reign of Queen Elizabeth I, and exercised powers like those which, during the reign of King Henry VIII, had been entrusted to Thomas Cromwell. The judges had the power of arresting suspected persons, imprisoning them, torturing them, and causing them to accuse their confederates or their friends. They could proclaim new articles of faith and impose them on recalcitrant consciences by compulsion of the severest and most odious kind. The court was abolished for abuse of power in 1641.

COURT OF HONOR, a court of chivalry, of which the lord high constable was judge, for the purpose of settling such disputes as had commonly been settled by duels. It was a continuation of what in the time of Henry IV was called *curia militaris*, military court. Suggestions have been made from time to time for the re-establishment of courts of honor, but the law has made provisions for settling larger affairs of offense against honor, such as libel and slander, and the need of a special court is not apparent.

COURT OF LOVE (Fr. *cour d'amour*), in medieval France and Germany, a tribunal composed of ladies illustrious for their birth and talent, whose jurisdiction, recognized only by courtesy and opinion, extended over all questions of gallantry. Such courts existed from the 12th to the 14th century, while the romantic notions of love which characterized the ages of chivalry were predominant. The decisions were made according to a code of 31 articles, which have been preserved in a manuscript entitled *De Arte Amatoria et Reprobatione Amoris*, written by André, royal chaplain of France, about 1170. Some of the troubadours were often present to celebrate the proceedings in verse, and the songs of these minstrels were not infrequently reviewed and judged by the tribunals. Among the ladies who presided were the Countess de Die, called the Sappho of the Middle Ages; Eleanor of Aquitaine and her daughter, Marie, countess of Champagne, and Laura de Sade, celebrated by Petrarch. There was such a court in Provence in the days of the troubadours. The following case was submitted to their judgment: A lady listened to one admirer, squeezed the hand of a second, and touched with her toe the foot of a third. With which of these three was she in love? René I, Duke of Anjou, attempted in vain to revive the courts of love, and the last imitation of them was held at Rueil at the instance of Cardinal Richelieu, to judge a question of gallantry, which had been raised in the Hôtel de Rambouillet.

Consult Reynouard, *Choi. de poésies originales des troubadours*, vol. 2 (Paris 1817); Méray, *La vie au temps des cours d'amour* (Paris 1876); also Paris, G., *Mélanges de littérature française du moyen âge* (Paris 1910).

COURT OF PRIVATE LAND CLAIMS. See UNITED STATES—Judicial System.

COURT OF SAINT JAMES. See SAINT JAMES'S PALACE.

COURT OF THE EXCHEQUER. See EXCHEQUER, COURT OF.

COURT OF THE LIONS. See ALHAMBRA.

COURT PLASTER, so called because originally applied by ladies of the court as patches on the face; black, flesh-colored, or transparent silk varnished over with a solution of isinglass and glycerin, which is often perfumed with benzoin.

COURTELINE, kōōr'tē-lēn', **Georges** (pseudonym of GEORGES MOINEAUX), French humorist: b. Tours, Department of Indre-et-Loire, France, June 25, 1861; d. Paris, June 25, 1929. After spending 14 months in the army, he worked briefly in the civil service. Literary success came with *Les Gaités de l'Escadron* (1886), a humorous portrayal of barracks life. He ridiculed bureaucracy in *Messieurs les ronds-de-cuir* (1893). Most of his life was devoted to the theater. His masterpiece *Boubouroche* (1893), a satire on women, deals with a gullible lover and his mistress. Most of his comedies have a Molièresque flavor, and his *La Conversion d'Alceste* (1905) is frankly imitative of Molière. Many of his novels and stories were also adapted for the stage. He has been called the Mark Twain of France, and resembles the American in his acute and caustic observations concealed beneath a surface of clowning.

COURTENAY, a distinguished English family, probably stemming originally from a French royal line.

WILLIAM COURTENAY (c.1342–July 31, 1396) became chancellor of Oxford University in 1367, a bishop of Hereford in 1370, and bishop of London in 1375. He was archbishop of Canterbury from 1381 until his death. He opposed John of Gaunt, sought to defeat the Lollards, and convened the council in 1382 which condemned the views of John Wycliffe. In 1381 he served as chancellor of England.

His nephew, RICHARD COURTENAY (d. Sept. 15, 1415), served as chancellor of Oxford in 1407 and again from 1410 to 1412. He defended the university in 1411 against the intrusion of Thomas Arundel, Archbishop of Canterbury, but the latter, aided by King Henry IV and Pope John XXIII, won the final victory. In 1413 Richard became bishop of Norwich and treasurer of the royal household of King Henry V.

Richard's grandnephew, PETER COURTENAY (d. Sept. 23, 1492), became bishop of Exeter in 1478, and bishop of Winchester in 1487. The leading part he played in the insurrection of 1483 against King Richard III led to his being attainted, but in 1485 King Henry VII restored him.

A later member of the family, HENRY COURTENAY (c.1496–Dec. 9, 1538), MARQUIS OF EXETER and EARL OF DEVONSHIRE, served King Henry VIII as envoy to France in 1525, later supported him in his divorce proceedings against Catherine of Aragon, and in 1536 was a judge at the trial of Anne Boleyn. The fact that his mother's father had been King Edward IV made him suspect of aspiring to the throne, however, and his correspondence with the king's avowed opponent, Reginald Cardinal Pole, led to his trial, conviction, and execution for treason.

His son, EDWARD COURTENAY (c.1526–September 1556), who had been imprisoned in the Tower of London with his father in 1538, was

released by Queen Mary in 1553 and restored to the earldom. He failed in his attempt to marry the queen, and then interested himself in Princess Elizabeth (later Queen Elizabeth I). He was again imprisoned in the Tower (1554), but in 1555 was released on parole and exiled. He died at Padua, Italy.

COURTESY, in law. See **CURTESY**.

COURTESY TITLE, a title assumed by or given to any person by common consent as an act of courtesy or respect, but to which title the individual has no valid, legal claim. See **TITLES**.

COURTHOPE, kōrt'ūp, **William John**, English man of letters: b. South Malling, July 17, 1842; d. Sussex, April 10, 1917. Educated at Blackheath, Harrow, and Oxford, he was civil service commissioner from 1892 to 1907 and professor of poetry at Oxford from 1895 to 1901. He edited the last five volumes of the standard edition of Pope (10 vols., 1871-1889), which was begun with Whitwell Elwin as editor. His other major work was his *History of English Poetry*, 6 vols. (1895-1910), spanning the period from Geoffrey Chaucer to Sir Walter Scott. His own poetry appeared in *Ludibria Lunae* (1869), *The Paradise of Birds* (1870), and *The Country Town and Other Poems* (1920). He published a life of Addison in 1882, and a series of his Oxford lectures, under the title *Life in Poetry, Law in Taste*, appeared in 1901.

COURTIS, kōrt'is, **Stuart Appleton**, American educator: b. Wyandotte, Mich., May 15, 1874. He studied at the Massachusetts Institute of Technology and the University of Chicago, and received the bachelor's degree at Teachers College of Columbia University in 1919 and the master's degree there in 1921. In 1925 he received a doctor's degree at the University of Michigan. He was director of instruction and dean of Detroit Teachers College, 1920-1925; professor in the school of education at the University of Michigan, 1919-1944, and emeritus professor there after 1944. From 1934 to 1944 he was a part-time professor at Wayne University. He originated the Courtis' "standard tests," a system for measuring the efficiency of school work. He was a member of the Hanus Committee on School Inquiry in New York City (1911-1912); the Gary Survey (1916); and the New York Survey (1924). His writings include *Why Children Succeed* (1925) and *The Measurement of Growth* (1932).

COURTNEY, kōrt'nī, **Leonard Henry**, 1st **BARON COURTNEY OF PENWITH**, English writer and statesman: b. Penzance, Cornwall, England, July 6, 1832; d. London, May 11, 1918. He graduated from St. John's College, Cambridge University, in 1855, and became a fellow in 1856. In 1858 he was called to the bar, but he soon turned to journalism and wrote leaders for the *London Times* from 1865 to 1881. From 1872 to 1875 he was professor of political economy at University College, London. He served as a Liberal and Liberal-Unionist member in the House of Commons from 1876 until 1900, when he was defeated because of his opposition to the Boer War. In 1880-1881 he was undersecretary of state for the Home Department, and in 1881

for the Colonial Office. He became financial secretary to the treasury in 1882, but resigned that office in 1884, when the government failed to accept his proposal for proportional representation. He early opposed Home Rule for Ireland, but later endorsed it and resisted imperialism in every direction. When the Liberals were returned to office in 1906, he was made a peer and sat in the House of Lords. During World War I he urged a negotiated peace. He wrote *The Working Constitution of the United Kingdom* (1901).

COURTNEY, **William Leonard**, English journalist: b. Poona, India, Jan. 5, 1850; d. London, Nov. 1, 1928. He was educated at Oxford University, and was a fellow and tutor in philosophy at New College, Oxford, from 1876 until 1890, when he joined the editorial staff of the *Daily Telegraph*, London. He was literary editor and dramatic critic of the paper until 1924, and editor of the *Fortnightly Review* from 1894. His works include *The Metaphysics of John Stuart Mill* (1879), *Studies in Philosophy* (1882), *Constructive Ethics* (1886), *Life of John Stuart Mill* (1889), *The Feminine Note in Fiction* (1905), and *The Passing Hour* (1925).

COURTOIS, kōōr-twā', **Bernard**, French chemist: b. Dijon, Department of Côte d'Or, France, 1777; d. Paris, Sept. 27, 1838. He was trained in pharmacy, and worked in the laboratory of Count Antoine François de Fourcroy in the École Polytechnique until his induction into the army in 1799. After his discharge he resumed his chemical researches. In 1804 he began work on nitrate of sodium, which is produced by decomposing nitrate of calcium with the carbonate of sodium obtained from kelp. In the course of his operations he observed that iron vessels were corroded if the liquors from which the sodium salts had been crystallized were kept in them for a time. Investigating the cause of this, he found that on distilling the liquors with sulphuric acid a body with a splendid purple vapor was liberated. He examined it and ascertained some of its properties, for instance, its formation of a detonating compound with ammonia, and then gave a specimen of it to Nicolas Clément-Desormes, who read a paper on it, and ultimately resigned the investigation to Joseph Louis Gay-Lussac. This was the first discovery of iodine. In 1815 Courtois' niter factory was ruined, and thereafter he gained a precarious livelihood by making various chemical products.

COURTOIS, **Gustave Claude Étienne**, French painter: b. Pusey, March 18, 1852; d. Paris, Nov. 25, 1923. He was a pupil of Jean Léon Gérôme at Paris and exhibited at the Salon in 1876. He painted *The Death of Archimedes*; *Narcisse* (in the Luxembourg); *Dante and Virgil in Hell*; *La Bayadère* (1882); *The Burial of Atala*; and a number of portraits. At the St. Louis Exposition in 1904 he exhibited *Adam and Eve in Eden*; *Cupid Feasting*; and a portrait of Mme. G. During 1880-1890 he was the most fashionable portrait painter in Paris.

COURTOIS, **Jacques**, French painter, known as **LE BOURGUIGNON** (Italian **IL BORGOGNONE**): b. St. Hippolyte, near Besançon, Feb. 12, 1621; d. Rome, Italy, Nov. 14, 1676. He was a pupil of his father, Jean Courtois, but went to Italy

in 1636 and served three years with the Spanish Army in Lombardy. He then studied at Bologna, Florence, Siena, and Rome, and came under the influence of Guido Reni and Francesco Albani in Bologna, and Pieter de Laar in Rome. He was especially eminent in battle scenes. When his wife died of poison, which he was suspected of having administered, he took the habit of a lay brother of the Jesuits, with whom he remained until his death though he still practiced his art.

His brother GUILLAUME (or GUGLIELMO) COURTOIS (1628-1679) was also an eminent painter who excelled in historical pieces, and assisted Jacques in some of his works. His pictures are to be found in nearly all of the galleries of Europe.

COURTSHIP OF ANIMALS. In sexually reproducing animals successful reproduction can be attained only if individuals can recognize members of their own species and differentiate between the sexes. In many species there is evidence that successful mating cannot occur until the male has attained dominance over the female. The functions of courtship behavior are related to these biological necessities. Courtship activities serve to establish or to strengthen the pair bond between a male and a female of the same species and to synchronize the sexual cycles of the members of such a pair. In some animals pairs may be formed a considerable time before actual mating occurs. Courtship displays are usually highly specific, and this helps to prevent the establishment of a lasting pair bond between members of different species. Some of the most spectacular courtship displays are found in those species in which the pair bond is of short duration. For example, in certain species of birds wherein the sexes meet only for the time involved in copulation (for example, prairie chickens, hummingbirds, and certain birds of paradise) the displays of the males involve elaborate postures, calls, and other activities for which special color patterns and structures have been evolved.

In many species of animals the males defend a "territory" and challenge with "threat displays" all members of their species which trespass. A rock may be a territory to a fish; an area of woodland or a few square feet on a rocky ledge may serve the same purpose for a bird. The "threat displays" of males on their territories elicit varying reactions from intruders of different sexes. A male intruder will either fight or flee; a receptive female will respond in a manner, varying with the species, which will reveal her sex and her degree of readiness to mate. Thus the initial phases of the male's courtship behavior often have a dual function: intimidation of rival males, and attraction of receptive females.

The functions of courtship behavior, then, are first to attract a mate and second to induce the mate to copulate. In some groups of animals which are able to detect sound the initial attraction of a mate is effected by an auditory stimulus. The chirping of crickets and the calls of frogs and toads are examples. The songs of male birds have a dual function. Primarily, bird song acts to advertise a male on his "territory" and actually aids in the defense of his territory against other males of the same species. The song also serves as an invitation to unmated females. In any one area the songs of the resident species of birds are highly specific and the females' response is very selective. Song thus acts to prevent or reduce

the probability that mixed pairs will be formed, and hence becomes an important isolating mechanism.

In the European locust, *Ephippiger ephippiger*, females which are ready to mate locate males by their "singing." Although females are attracted to invisible singing males from at least 30 feet away, they do not go to silent males even though the latter may be much closer. When males are silenced by having their wings glued together, they are unable to attract a single female.

The attraction of a mate by scent has been observed in butterflies and moths. In most species the females have special scent glands which produce highly specific odors. The receptor organs of the males are located in the antennae.

In the common garden snail, *Helix pomatia*, there is a lengthy courtship, culminating in the release of a small calcareous dart which is driven into the partner's body. Since this animal is hermaphroditic, the release of the dart mutually stimulates the partners to copulate.

Male fiddler crabs of the genus *Uca* attract the females by waving the large claw in a highly specific movement. The manner of waving also serves to warn off other males of the same species.

Courtship behavior in the three-spined stickleback, a small fish of the genus *Gasterosteus*, has been studied in great detail. The male settles on a "territory" which he defends against other male sticklebacks and in which he builds a nest. When a female with a swollen abdomen, indicating that she is ready to lay her eggs, appears within sight the male begins his courtship with a "zigzag dance." This consists of a series of up to 20 zigzag movements in rapid succession. The female reacts to the red color of the male and to his zigzag dance by swimming toward him. This in turn induces the male to swim quickly to the nest and the female follows. The male points his head at the nest entrance, thereby stimulating the female to enter. The male now begins to thrust his snout at her rump with a quick, rhythmic, quivering movement and the female responds by spawning her eggs into the nest. The presence of fresh eggs in the nest stimulates the male to fertilize them.

The jewel fish (*Hemichromis bimaculatus*) is well known to tropical fish culturists. During the breeding period the male defends a territory against all other fish which venture near the rock he has selected as a nest site. Other males and non gravid females flee before his attacks but the egg-laden female is attracted by the display movements of the male and stands her ground. Mutual displays ensue which involve "quivering" movements in a horizontal position and "head-standing" postures in a vertical plane. The head-standing position is the same as that taken when the egg masses are cleaned of algal or fungoid growths later on. These displays serve to bring the members of the pair into reproductive synchrony, and finally the female deposits her eggs on the rock chosen by the male and he fertilizes them.

In certain species of salamanders the males discharge their sperm cells in a small stump-shaped packet called a spermatophore, which they deposit on the ground or in the water. Courtship activities in these animals precede the discharge of the spermatophore and function both to stimulate the male to produce it and the female

to pick it up. In the marbled salamander (*Ambystoma opacum*), a chiefly nocturnal species, the senses of smell and touch are utilized in courtship. The males possess specialized glands on the head and at the base of the tail. The odor of the secretions of these glands, coupled with special movements and caresses by the male, attracts and stimulates the female and causes her to follow the male closely, sometimes for as long as an hour. The male eventually discharges a spermatophore and the female, if sufficiently stimulated by the courtship behavior of the male, picks it up in her cloaca.

Courtship behavior has been studied in birds to a greater extent than in most other groups of animals because the displays of birds are highly varied and easily observed. Displays tend to involve exaggerated, unusual movements during which peculiar adornments are thrust into prominence. Plumes, patches of bare skin, brightly colored areas of plumage, ruffs, crests, inflatable sacs, and other structures are utilized. The male common pigeon (*Columba livia*) of the city parks pursues a female with tail fanned and scraping the ground while he coos and bows. The display of the peacock is known to everyone.

Some of the most elaborate displays occur in those species which utilize a territory only as a mating station. Males of the prairie chicken (*Tympanuchus cupido*) of the Great Plains establish small territories on a communal "booming ground." Each male defends his few square yards of ground against the other males and awaits the arrival of a female. Females are attracted to the "booming ground" by the calls of the males, which can be heard far across the prairie. When a female arrives on the booming ground the males begin their full display. First a male makes a short run, stops, and stamps his feet rapidly. At the same time the brilliant orange air sacs on each side of the neck begin to inflate and the long feathers of the nape are erected. The tail is fanned and the fleshy orange "eyebrows" become prominent. The "booming" which immediately begins lasts about three seconds and consists of three hollow, low-pitched notes, "oo-loo-woo." Between periods of "booming" the male performs an elaborate bowing ceremony, during which he prostrates himself with outstretched wings and bill touching the ground. Following the booming and bowing of the male the female crouches and copulation follows.

The male Gould's manakin (*Manacus manacus*) of Panama is a small yellow and black species. The males clear a court approximately 20 by 30 inches on the forest floor, leaving only the bare earth. Courts of individual males are usually about 30 feet apart. In the breeding season the males spend most of the day at the court, leaving only to feed for short periods. When a female comes into the area the male begins his display. With the elongate feathers of the throat erected and thrown forward to form a projecting "beard" he calls "pee-you" with increasing volume and tempo as he hops rapidly from perch to perch. Suddenly he raises his wings and vibrates them rapidly, making a whirring sound as he calls "chee-poooh." He now enters the court and springs from side to side around the court, making a snapping sound with the wings and always alighting facing the spot from which he jumped. Sometimes a bird will press the tip of his beak into an upright stick and flutter like a moored

dirigible, or will alight in the court, head down and wings vibrating. The female is leaf-green in color and difficult for the human eye to detect, but the male manakins see her a long distance away. The female goes to the court of her choice, where the male begins to jump back and forth across the court. The female joins in the "dance" and the two birds leap rhythmically across the court, passing one another in mid-air. Finally they fly away together, actual mating taking place away from the court.

The males of the Brandt's cormorant (*Phalacrocorax penicillatus*) of the Pacific coast take up territorial stations on the breeding grounds. In their territories the males perform an elaborate "advertising display," one of the functions of which is to attract a female bird and induce her to pair. The "advertising display" is performed as follows: the male squats with the breast almost touching the substrate and the neck drawn back so that the nape rests on the back with the bill pointed upward. The tail is cocked and spread, and the head plumage is fluffed out. The gular (throat) pouch bulges and the brilliant blue color of the pouch is fully exhibited. The wings are lifted slightly from the back and slowly fluttered. This flutter phase of the display may last for as long as 25 seconds, then the wings are partly folded and the head thrust forward and downward in a hammer-like stroke. As many as 15 strokes may be repeated before the bird reverts to the flutter phase of the display and begins the cycle over again.

In many species of birds the lining of the mouth is brightly colored and is used in a type of display called ceremonial gaping. The climax of the courtship display of the red-breasted merganser (*Mergus serrator*) comes when the drake faces the duck and opens his beak to its fullest extent, revealing the brilliant red mouth lining. The European cormorant (*Phalacrocorax carbo*) displays the vivid yellow of its mouth lining as part of its courtship performance, while both male and female kittiwakes (*Rissa tridactyla*) crane their necks toward one another and scream with bills agape, revealing the lurid orange-red interior.

Some species of birds perform mutual displays during courtship, both members of the pair taking part. In the western grebe (*Aechmophorus occidentalis*) there are three types of mutual displays. In one the two birds swim side by side with necks arched, bills turned straight down, and their black crests spread. As they swim they sway their necks from side to side, touching them against their bodies. Sometimes this performance culminates in the "water glide" display, in which both birds suddenly stand upright as if running on the water, and with wings appressed tightly to their bodies, splash along the surface for 20 or 30 feet, dropping at last to the water and ending in a glide of 15 feet or more.

A third type of mutual display occurs more rarely. Both grebes dive and reappear with pieces of vegetation in their bills. Facing each other, they rise, treading water, with bodies half above the surface and necks stretched straight up. In this position, breast to breast, they slowly make three or four circles, then drop back to the water, flip the plant material from their beaks, and swim away.

The male Anna's hummingbird (*Calypte anna*) performs a spectacular display flight. First he towers upward until almost lost to sight, then

shoots vertically downward in a "power dive" at tremendous speed, suddenly altering his course at the bottom of the dive to describe an arc like a shallow "J." At the bottom of the arc a sharp, explosive note is produced by the force of the air stream on the modified outer tail feathers. He hovers a moment at the terminus of the arc and sings "zeele-zeele," then repeats the performance. This display may be directed toward a female, another male, or almost any other animal which ventures into the male's territory.

The remarkable performances of the various species of birds of paradise are probably the most elaborate courtship displays of any animal. The male king bird of paradise (*Cicinnurus regius*) begins his display with several squeaking notes, next he spreads his wings, flaps them, and, puffing out his silky-white lower feathers, bursts into a melodious warbling song. As he sings he displays his beautiful fanlike side plumes and spreads his short tail, pressing it close over his back so as to throw the long "tail-wires" over his head, while he gently sways his body from side to side. The spiral tips of the long "tail-wires" are bright green, and the swaying motion tosses them from one side to the other. The finale comes when he turns suddenly around and shows the fluffy white under tail coverts, then bends down on the perch and opens his mouth to reveal its light apple-green lining. A single drawn-out note is given, the tail is lowered, and the display is over.

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CHARLES G. SIBLEY,
Associate Professor of Ornithology, New York
State College of Agriculture, Cornell University.

COURTSHIP OF MILES STANDISH,

The, a narrative poem by H. W. Longfellow, based on a New England tradition, published in 1858. Priscilla archly asks, "Why don't you speak for yourself, John?" when John Alden urges the suit of his friend Miles Standish.

COURVILLE, town, Province of Quebec, Canada, in Quebec County, on the St. Lawrence River, about seven miles northeast of Quebec city, of which it is largely a residential suburb. Pop. (1951) 3,148.

COUSIN, kōō-zān', Jean, THE ELDER, French artist: b. Soucy, near Sens, 1490; d. Paris, 1560. He is generally regarded as the earliest French historical painter. He chiefly painted on glass, but his *Last Judgment*, painted on canvas for the convent of the Minims at Vincennes, is esteemed an excellent work. In 1540 he designed the festive decorations for the entry of Emperor Charles V at Paris. Noteworthy among his sculptured works are the tomb of Admiral Philippe de Chabot (Louvre) and the sculptures formerly in the chapel of Pagny (Burgundy). A large number of wood cuts have also been credited to him. He was the author of *Traité de perspective* (1560) and *Livre de portraicture* (1571).

His son, JEAN, THE YOUNGER, also an artist: b. Sens about 1522; d. Paris, 1590. He designed the glass windows and possibly the sculptures of the Castle of Fleurigny at Sens. The glasses in

the Church of Saint-Gervais, Paris, are also attributed to him. He painted five portraits of the Bouvyer family.

COUSIN, Victor, French philosopher: b. Paris, Nov. 28, 1792; d. Cannes, Jan. 12, 1867. He lectured at the Sorbonne during 1815-1817, and again from 1828 until his retirement in 1851. In 1830 he was made a councilor of state, created a peer of France, and appointed director of the École Normale; in 1840 he became minister of public instruction in the Cabinet of Louis Adolphe Thiers. He founded a school of eclectic philosophy, combining the doctrines of the Scottish school of Thomas Reid and Dugald Stewart, based on sensation, with those of Friedrich W. J. von Schelling and Georg W. F. Hegel, which rest on the opposite principle of idealism or intuition. Although he was not an original thinker he possessed in a high degree the faculty of clear exposition, and for that reason his lectures and his writings enjoyed a great popularity. He rendered a memorable service both to philosophy and literature by his translation of *Plato* (1840). Besides his *Fragments philosophiques* (1826) and other works on that theme, he is the author of a few biographical sketches, mostly of characters related to the spiritual and intellectual movements of the 17th century, as *Jacqueline Pascal*; *Mme. de Longueville*; *Mme. de Hauteclerc*; *French Society in the 17th Century*. As a lecturer and philosophical writer Cousin was distinguished by a rare combination of eloquence, enthusiasm, and, as already stated, clearness of exposition. He possessed a beauty of style such as no modern or ancient philosopher excepting Plato has equaled. He rendered a very valuable service to his native land in the part he took in the organization of primary instruction. In 1831 he visited Germany to study educational methods there, and the *Rapport sur l'Etat de l'Instruction Publique* published on his return had powerful influence on subsequent legislation.

COUSIN-MONTAUBAN, kōō-zān' mōn-tō-bān', Charles Guillaume Marie Apollinaire Antoine, COMTE DE PALIKAO, French military officer and statesman: b. Paris, June 24, 1796; d. Versailles, Jan. 8, 1878. In 1847, while serving with the cavalry in Algeria, he captured Abd-el-Kader, leader of the Arab revolt, and for this success he was promoted general of division. He commanded the French forces in the joint Franco-British expedition in China during 1859-1860, occupying the capital city of Peking (Peiping). Napoleon III created him comte de Palikao in 1862. With outbreak of the Franco-Prussian War in 1870 he was appointed war minister, and for 24 days during August-September he was president of the council, as head of the government reorganizing and strengthening the armed forces. After Emperor Napoleon III surrendered at Sedan on September 2 he was offered the dictatorship of France, but refused; and with the fall of his government he took refuge in Belgium. He wrote *Un Ministère de la guerre de vingt-quatre jours* (1871).

COUSINS, kūz'nz, Samuel, English mezzotint engraver: b. Exeter, Devonshire, May 9, 1801; d. London, May 7, 1887. He first came into public notice by his mezzotint engravings of the works of Sir Thomas Lawrence, notably *Lady Acland and her Children* in 1826. These were

Catholicism, which it denounced. It was again subscribed to in 1590 and 1596.

After the union of the crowns of Scotland and England (1603), because the Stuarts favored the Episcopal Church, the dangers which threatened Presbyterianism brought its followers in Scotland to a closer union. And when, in 1637, Charles I tried to force the Church of Scotland to accept a new liturgy modeled after the English, disturbances arose which ended in the forming of a new covenant the following year. This was called the National Covenant (1638). The subscription of it began in the Grayfriars' Church, Edinburgh, on Feb. 28, 1638. Copies were circulated throughout the country for general signature, many of which are still in existence. The National Covenant, with the confession of faith which it embodied, was ratified by the General Assembly at Glasgow on Nov. 21, 1638, and by the Scottish Parliament in 1640. In 1642 the English Parliament applied to the Scots for aid in the civil war taking place in the reign of Charles I, and the application was pressed more earnestly in the following year. The Covenanters, who were then masters of Scotland, demanded that the English Parliament should take the covenant and assimilate the doctrine and discipline of the churches of the two nations. In consequence of this stipulation, on Sept. 25, 1643, both houses of Parliament met at Saint Margaret's Church, Westminster, along with the Assembly of Divines and the Scottish commissioners, to take the Solemn League and Covenant, which had been modified by the General Assembly. After prayers and sermons, all present held up their hands in testimony of assent to it; and afterward, in their several houses, they subscribed it on a Parliament roll. The House of Commons ordered it to be taken by all persons in their respective parishes on the next Lord's Day.

Both covenants were signed by Charles II on his landing in Scotland in 1650, and again at his coronation at Scone on Jan. 1, 1651. The Covenanters were now the supreme power in Scotland, but their supremacy was undermined by their defeat by Oliver Cromwell at Dunbar in 1650, and vanished when Charles II was restored in 1660.

In 1662, episcopacy was restored and the covenant was renounced by act of Parliament, in both England and Scotland. Oppressive measures were inaugurated against the Covenanters who, outraged, took up arms in 1665 in defense of the Presbyterian form of church government. The Presbyterian ministers who refused to acknowledge the bishops were ejected from their parishes and drew around them crowds of their people on the hillsides and in secret places, to attend their ministrations. These meetings, called "conventicles," were denounced as seditious, and to frequent them, or to hold communication with those frequenting them, was forbidden on pain of death. The severity with which the recusants were treated provoked them to take up arms in defense of their opinions. The first outbreaks took place in the hill country on the borders of Ayr and Lanark shires. At Drumclog, a farm near Loudon Hill, a conventicle was attacked in 1679 by a body of dragoons under Graham of Claverhouse, but the Covenanters were successful in defeating their assailants. This defeat, and the murder of Archbishop James Sharp on Magus Moor in

1679, alarmed the government which sent a large body of troops to put down the insurgents, who had increased in number rapidly. The two armies met at Bothwell Bridge, where the Covenanters were totally defeated (June 22, 1679).

In consequence of the rebellious protests against Charles II, called the Sanquhar Declaration, put forth in 1680 by Richard Cameron, David Cargill, and others, as representing the more irreconcilable of the Covenanters (known as Cameronians), and a subsequent proclamation engineered by James Renwick in 1684, the government proceeded to more severe measures. An oath was required of all who would free themselves of suspicion of complicity with the Covenanters, and the dragoons sent out to hunt down the rebels were empowered to kill anyone who refused to take the oath. During this "killing-time," as it was called, the sufferings of the Covenanters were extreme. But notwithstanding the great number who were put to death, their fanatic spirit seemed only to grow stronger. Even after the accession of William III and the settlement of the revolution of 1688 which restored the Presbyterian Church government (without renewal of the covenants, however), some of the extreme Covenanters refused to acknowledge William because of his acceptance of episcopacy in England; and these formed the earliest dissenting sect in Scotland, calling themselves Covenanters or Reformed Presbyterians.

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COVENT GARDEN. Originally the garden of the abbot of Westminster, the name being corrupted from Convent Garden, it is a spacious square north of the Strand in London, celebrated as a great market for fruit, vegetables, and flowers. The square was formed about 1631 from plans drawn by Inigo Jones, and has an arcade or piazza on the north and northeast side and Tavistock Row on the south. In the 17th century Covent Garden was a very fashionable quarter. The now-famous market appears to have originated about 1656 in a few wooden sheds and stalls. The first Covent Garden Theater was erected there in 1733; it was destroyed by fire in 1808, rebuilt from a design by Sir Robert Smirke in 1809, and burned again in 1856. The present opera house was built in 1858, and was used as a dance hall for the armed forces in World War II.

COVENTRY, kōv'ən-trī, town, Conn., located in Tolland County about 30 miles southeast of Hartford, on the Willimantic River. It is served by the New York, New Haven and Hartford Railroad, the Central Vermont Railway, and buses of the New England Transportation Company. Coventry is an agricultural community, a large part of its working population finding employment in nearby industrial cities. Lake Wangumbaug is within the town. Coventry was named and incorporated in October 1712, and has an area of 25,509 acres. It is the birthplace of Nathan Hale. Pop. (1940) 2,102; (1950) 4,035 (prelim.).

COVENTRY, city and county borough, England, in Warwickshire, about 85 miles northwest of London, on the Sherbourne. It became a civic corporation in 1344 and a county in 1451; was incorporated with the county of Warwick in 1842; and became a county borough in 1888. The borough sends three members to Parliament. One of the oldest cities in England, a Benedictine monastery was founded there in 1044 by Earl Leofric and Lady Godiva (q.v.), his wife, with whose famous legend Coventry is associated. Many of the buildings, including the cathedral, were destroyed by Henry VIII; their remains may be seen near the present-day Holy Trinity Church. Parliaments were convened there by the earlier monarchs of England, several of whom occasionally resided in the city. Pageants and processions were popular in former times, and the Coventry Fair, held during White Week, was authorized by Henry VIII as an eight-day festival. The dukes of Norfolk and Hereford met here to fight on Gosford Green, and the incident was used by Shakespeare in *Richard II*. The phrase, "to send to Coventry" (meaning to refuse to associate with someone) is believed to have come from the custom of Birmingham people's sending their political prisoners to Coventry.

Once noted for its many fine churches—among them the 14th-century St. Michael's Cathedral, an excellent example of Perpendicular architecture; the cruciform Holy Trinity Church; and Christ Church—much of Coventry was blasted into ruins in German bombing raids of Nov. 14-15, 1940, and April 8, 1941. Many interesting architectural remains survived, although the cathedral (except for its spire), Christ Church, the women's almshouses (16th century), the Central Library, King Henry VII's School, and other public buildings were destroyed. St. Mary's Hall (14th century), once a craft guild center, was severely damaged.

Formerly famous for its ribbons, woollens, silk-dyeing, broadcloths, and caps, modern Coventry's manufactures include bicycles, automobiles, airplanes and engines, telegraph and telephone equipment, machine tools, naval stores, munitions, and rayon goods. Before the advent of British nationalization, the city owned its gas, electrical, and water plants. It has an excellent sewerage system. There are good road, rail, and canal communications, and an airport was built in 1936. Pop. (1951) 258,211.

COVENTRY, township, R. I., located in Kent County, and served by the New York, New Haven and Hartford Railroad. It has an area of 62 square miles and is made up of several small villages; those in the northeastern and central part of Coventry are chiefly industrial; those in the northwest and southwest are agricultural. Prior to 1741, Coventry was a part of Warwick; in that year it was incorporated as a separate township. Its center of government is in the village of Washington. Pop. (1940) 6,998; (1950) 9,852 (prelim.).

COVENTRY PLAYS. A series of 42 early English miracle plays, related to the old English morality and mystery plays, containing the New Testament story. Coventry was famous in the period 1392 to 1589 for the performance of its Corpus Christi Day plays by the Gray Friars. The Coventry plays were published in

a volume by the Shakespeare Society in 1841, under such titles as *The Creation, The Fall of Man, The Birth of Christ, The Resurrection*, and *The Ascension*. See also MIRACLE PLAYS.

COVERDALE, kŭv'ēr-dāl, Miles, English bishop and reformer: b. probably at Coverdale, Yorkshire, 1488; d. Feb. 1568 (buried in London, Feb. 19, 1568). He was educated at Cambridge, entered the convent of the Augustinian friars, was ordained a priest at Norwich in 1514, and entered the convent of Austin friars at Cambridge where he came under the influence of Robert Barnes who became prior about 1523. He also became a friend of Thomas More and Thomas Cromwell at this time. Some years later he was led to embrace and preach the reformed doctrines and, having gone abroad, adopted Lutheranism and is said by Foxe to have assisted Tyndale in translating the Pentateuch. In 1535 his own translation of the Scriptures appeared with a dedication to Henry VIII, this being the first printed English version of the entire Bible. No publisher's name appears on the imperfect copies which now exist, but it was probably printed by Nicolson in folio and quarto in 1537, and by Froschover at Zurich in 1550. It is possible that Jacob van Meteren was its promoter, and that he engaged Coverdale to do the translation for him. In 1538 he was engaged by Cromwell to superintend the printing in Paris of a revised English version of the Bible; and when the work was halted by the French ecclesiastical authorities, the presses and type were brought to England in 1539, and there the so-called Great Bible, with a preface by Archbishop Cranmer, was printed by Grafton and Whitchurch in 1540. After the execution of Cromwell (1540), Coverdale went to Germany where he became a Lutheran minister and taught school in Bavaria. Returning to England in 1548, he was made almoner to Queen Catherine Parr, and in the following year assisted Whitchurch in the second volume of the *Paraphrases of Erasmus*. In 1551, during the reign of Edward VI, he was appointed bishop of Exeter, but was ejected on the accession of Mary Tudor and was thrown into prison. Two years later he was liberated and proceeded first to Denmark and subsequently to Geneva where he assisted in preparing the Geneva Bible (published in 1560). After the accession of Elizabeth, he returned to England (1559) and was rector of Saint Magnus, London Bridge, until his resignation in 1566.

His writings are numerous; biographies may be found in the Parker Society editions of Coverdale's pieces, an index to which may be found in Gough's *General Index to the Parker Society*. Consult also his biography in the *Dictionary of National Biography* (Vol. 12); his writings and letters, edited by George Pearson (2 vols., 1844-1846); and Guppy, Henry, *Miles Coverdale and the English Bible* (Manchester University Press 1935).

COVERLEY, kŭv'ēr-lī, Sir Roger de. A literary character introduced by Sir Richard Steele in the *Spectator* in 1711 as a Worcestershire gentleman whose great-grandfather had invented "the famous country dance which is called after him." He was further portrayed by Joseph Addison as a lovable, generous, somewhat eccentric figure in 20 Sir Roger de Coverley papers in the *Spectator* (1711-1712), and to a lesser extent by Addison's cousin, Eustace Budgell. The old English country dance resembled its more modern American form, the Virginia reel.

COVILHA, kō-vê-lyǎn', commune, Portugal, in the modern district of Castelo Branco, and in the province of Biera Baixa, on the south-east slope of the Serra da Estrella, some 50 miles east of Coimbra. In the neighborhood there are noted sulphurous baths, and the town has recently become a skiing center. Covilhã contains dyeworks and important cloth factories. Pop. (1940) 19,213.

COVILLE, kō'vīl, **Frederick Vernon**, American botanist: b. Preston, N. Y., March 23, 1867; d. Washington, D.C., Jan. 9, 1937. He was educated at Cornell University and was instructor in Botany there (1887-1888) and assistant botanist in the United States Department of Agriculture (1888-1893). From the last named year he was chief botanist of that department, as well as curator of the United States National Herbarium. He was instrumental in founding the Desert Botanical Laboratory in Tucson, Ariz. He published *Botany of the Death Valley Expedition* (1893); *Experiments in Blueberry Culture* (1910); and many other papers relating to systematic, geographic, and economic botany.

COVINGTON, kŭ'ing-tŭn, city, Georgia, and Newton County seat, altitude 747 feet, on the Georgia and the Central of Georgia railroads, 32 miles east-southeast of Atlanta. It has twine, fabric, lumber, and cotton mills, and manufactures fertilizer and trousers. Covington was incorporated as a town in 1822 and as a city in 1854. The water supply is municipally owned and the government is by mayor and council. Pop. (1950) 5,192.

COVINGTON, city, Kentucky, and seat of Kenton County, altitude 513 feet, on the Ohio River opposite Cincinnati (with which it is connected by two bridges, one of them a suspension bridge opened in 1866 and designed by John A. Roebling) and at the mouth of Licking River, opposite Newport, also connected by bridges to Covington. It is served by the Chesapeake and Ohio, Louisville and Nashville, and Cincinnati Southern railroads, and three federal and two state highways. It is an important shipping point by rail, water, and highway for Kentucky products, notably thoroughbred horses and other livestock, and is the second most important city in Kentucky. Occupying an area of about 5¼ square miles in a beautiful plain partly surrounded by hills, Covington has fine, wide streets, handsome residences (many Cincinnati business men live here), a public library, courthouse and city hall, Latonia Race Track, and Devou Park (550 acres). Charitable institutions include a hospital for contagious diseases, Catholic and Protestant orphan asylums, and a home for aged women. Covington is the see of a Catholic bishop, and St. Mary's Cathedral, a replica of Notre Dame of Paris and noted for its stained glass windows, is one of the finest ecclesiastical structures in the state. The city is the seat of Villa Madonna College (1921; coeducational), of the Northern Kentucky State Vocational School, and of other private institutions.

It has important manufactures of X-ray equipment, drilling machines, lathes, cigars, tobacco, prison equipment, iron, textiles, lumber, paper bags, brass and bronze products, signs, and other varied products.

Settled about 1812 as a ferry crossing with a tavern, it was platted three years later, chartered as a city in 1834, and is now governed by a city manager with mayor and commissioners. The water supply system is municipally owned and is drawn from the Ohio River about 13 miles above the city. Pop. (1930) 65,252; (1940) 62,018; (1950) 64,452.

COVINGTON, town, Louisiana, seat of St. Tammany Parish, 37 miles north of New Orleans, situated on the Bogue Falaya, near Lake Pontchartrain. Mainly an agricultural town with strawberries, oranges, and cotton being produced in the surrounding region, it manufactures charcoal, tung oil, and wood preservatives. It is a year round resort, with excellent hunting and fishing afforded.

The town was settled as early as 1769, incorporated in 1813, and has been parish seat since 1828. It is governed by a mayor and council. Pop. (1950) 5,113.

COVINGTON, town, Tennessee, and Tipton County seat, altitude 311 feet, on the Illinois Central Railroad, 38 miles northeast of Memphis. It is in a cotton-growing region, and has textile industries and cottonseed factories. The town has a public library. It was settled about 1800 and incorporated in 1833. Government is by mayor and council. Pop. (1950) 4,379.

COVINGTON, town, Virginia, Alleghany County seat, altitude 1,245 feet, on Jackson River and the Chesapeake and Ohio Railroad, situated in the midst of the Allegheny Mountains, 35 miles north of Roanoke. The West Virginia Pulp and Paper Company has a large plant here; other industries are rayon and textiles. There are coal and iron fields nearby and some limestone quarrying. The town was incorporated in 1873 and has a town manager. Its water system is municipally owned. Pop. (1950) 5,860.

COVODE, John, American congressman: b. Westmoreland County, Pa., March 18, 1808; d. Jan. 11, 1871. He was a farmer's son of Dutch blood and became a manufacturer and railroad owner. He entered public life as a Whig, served two terms in the state legislature, was sent to Congress in 1854 by the anti-Masons, and was re-elected in 1856 as a Republican, serving by regular re-elections until 1863. In 1860 he was appointed chairman of the special committee to investigate President James Buchanan's conduct in forcing through the Lecompton Bill (see title below, and **LECOMPTON CONSTITUTION**), and his report was valuable ammunition for the Republican Party. He was a member of the committee on the conduct of the war, and after Andrew Johnson's accession he was sent to the South to aid in that president's reconstruction policy, but was recalled for lack of sympathy with it. In 1867 he was again elected to Congress, and was a strong opponent of Johnson, introducing the resolution of impeachment against the president into the House of Representatives.

COVODE INVESTIGATION, 1860. President Buchanan, in the struggle to have Congress validate the Lecompton constitution (q.v.), was urged by the party organs to save the unity of the Democratic party, which was menaced with irremediable division, by using

the patronage at his disposal to bring the hesitating members into the ranks. In the debates at the opening of the 36th Congress, 1859-1860, two anti-Lecompton Democrats alleged that he had attempted to use corrupt influence with them. On March 5, 1860, John Covode moved the appointment of a committee to inquire whether the president or any other official had attempted, by money, patronage, or other improper means, to influence legislation or the execution of the laws. Despite Democratic objection that only insinuations and no specific charges were made, the rules were suspended by 117 to 45, the resolution was adopted, and an investigating committee of five was appointed, with Covode at the head. Buchanan sent a message of protest, March 28, objecting on the ground that the president could be indicted only by impeachment, that this was an indictment, and that such a method was inconsistent with the dignity of the office. The protest was declared unfounded by 88 to 40. On June 16, the committee reported, the Republican members declaring that the mass of evidence collected was proof of corrupt use of patronage, and Covode later alleged that they found also bribery, as evidenced by bankbooks. The Democratic members declared the allegations unsupported. No action was recommended to the House by the majority report, and none was taken. On June 22, Buchanan sent a second message protesting against the rejection of his first and saying that on such views no man of honor and principle could accept the presidency.

Consult U.S. Congress, *House Report 648* (Washington 1860); Buchanan, James, *Mr. Buchanan's Administration on the Eve of the Rebellion* (New York 1866); Curtis, G. T., *The Life of James Buchanan*, 2 vols. (New York 1883).

COW, the mature female of such bovines as domestic cattle, yak, buffalo, bison, most Old World antelopes; also the mature female of other large terrestrial herbivores such as the giraffe, elephant, rhinoceros, tapir, and hippopotamus. The term cow has been established for the mature female of all cetaceans (whales, dolphins, porpoises), all pinnipeds (seals, sea lions, walruses), and all sirenians (dugongs, manatees or sea cows). The term cow is used interchangeably with the term doe for the mature female of the largest members of the deer family (reindeer, caribou, moose, elk, wapiti). The term has been extended to certain nonmammalian animals kept as cattle for food, such as the terrapin, or tended and "milked," as is the plant aphid by ants.

COW LILY. See NUPHAR.

COW PARSNIP, a genus (*Heracleum*) of about 60 species of tall biennial or perennial herbs of northern temperate distribution with large compound leaves, broad umbels, and white or purplish flowers, belonging to the parsley family (Umbelliferae). Masterwort (*H. lanatum*), a commonly used forage plant, is a tall (nine feet) woolly perennial with ternate leaves, found in wet meadows in eastern Asia and in North America, where its southern range is from Georgia to Arizona. It is doubtful that it is poisonous to cattle. Another species, eltrof or helitrot, hogweed (*H. sphondylium*) is like masterwort in habit and structure. Pliny attributed great medicinal importance to the genus in the 1st century A.D. and dedicated it to Hercules, who used it in medicine.

COW PILOT. See SERGEANT MAJOR.

COW PLANT, ^{Australian}, the common name of a woody climbing member (*Gymnocma sylvestre*) of the milkweed family (Asclepiadaceae) found in the forests of Queensland, India, and tropical Africa. The root, as well as the rest of the plant, contains a milky juice of bitter, even saltish, taste. This is due to a glucoside, gymemic acid, which on chewing parts of the plant destroys the sense of taste for sweetness and bitterness. East Indians on a sugar-free diabetic diet chew the leaves of this plant. The root is applied locally and internally as a remedy for snake bite. The Singalese use the sap of another Asiatic species (*G. lactiferum*) as a substitute for cow's milk. The small yellow flowers lack a corolla, leaving the filaments exposed, hence the generic name. In the United States, cow plant is sometimes applied to the great laurel (*Rhododendron maximum*).

COW TREE, a common name applied to various plants yielding copious latex used in place of milk. Half a dozen species of the genus *Couma* of the dogbane family (Apocynaceae) are regarded as cow trees, as is *Manilkara Fluberi* of the sapote family (Sapotaceae), found in the lower Amazon region, where it attracted the attention of the famous traveler Richard Spruce in 1849. Cow tree is mostly used for the cow breadnut tree (*Brosimum utile*) of the mulberry family (Moraceae). It is a large tree growing to a height of 70 feet, native in tropical America and widely known for its agreeable and wholesome latex used as food by natives. Another species, the breadnut tree of Jamaica (*B. allicastrum*), is native in Yucatán, Central America, and the West Indies. It grows to 100 feet in height and has large leathery leaves up to seven inches long. This species is grown in the tropics for its leaves and young shoots, used as fodder, and chestnut-sized seeds (breadnuts), which are roasted or boiled before they are eaten.

COWAGE. See COWHAGE.

COWANSVILLE, kou'änz-vīl, town, Province of Quebec, Canada, situated on the Yamaska River, 25 miles east-southeast of St Jean. Industries include furniture manufacturing, woodworking, and silk and cotton milling. Pop. (1951) 4,431.

COWARD, kou'ērd, Noel, English playwright, actor, and composer: b. Teddington, England, Dec. 16, 1899. Educated privately, he made his stage debut at the age of 11, appearing later in repertory and provincial theaters. He first showed his versatility in *London Calling*, which appeared at the close of World War I, and for which he wrote the book, music, and lyrics, and played the leading role. His other plays, usually reflecting some aspect of the contemporary scene, include *The Vortex* (1925), his first critical success; *Private Lives* (1930); *Design for Living* (1932); *Tonight at 8:30* (1936); *Blithe Spirit* (1941); *Relative Values* (1951); and *Caligula* (1951), the deeply patriotic play which also was made into a successful film. His other important films have included *In Which We Serve* (1942), *This Happy Breed* (1944), and *Brief Encounter* (1945). He has written a great number of popular songs, both sentimental

and satirical. His autobiography, *Present Indicative*, appeared in 1937 and he is also the author of *To Step Aside* (1939), *Middle East Diary* (1945), and *Star Quality* (1951).

COWBANE or **WATER DROPWORT**, a poisonous erect American herb (*Oxypolis rigidior*) of the parsley family (Umbelliferae) found in bogs, swamps, and wet woods in the eastern and southern United States. The name cowbane is also applied to water hemlock (q.v.), another member of the same family.

COWBERRY, a name sometimes applied to the marsh fivefinger (*Potentilla palustris*) of the rose family (Rosaceae). A species about two feet high with woody stems rooting in water or marsh and purple flowers, found in North America (Alaska to Greenland, south to New Jersey, Ohio, Illinois, Iowa, and west to California) and in northern Eurasia. The name cowberry is also used for the mountain cranberry or rock cranberry (*Vaccinium vitis-idaea* var. *minus*) of the heath family (Ericaceae), a creeping evergreen with red, slightly bitter berries, found in subarctic North America to New England, Minnesota, and British Columbia, but smaller than the typical European species.

COWBIRD, any of seven species of American birds of the family Icteridae, so called because they walk about among cows and buffaloes to secure insects disturbed by the grazing animals. In most of these species the female cowbird builds no nest and lays its eggs in the nests of other birds, which incubate the eggs and rear the young cowbirds. Best known is the brown-headed cowbird (*Molothrus ater*), found over most of North America. The male, some eight inches long, is shiny black with a brown head; the smaller female is dark gray and brown. The female cowbird is very adept at finding the nests of sparrows, vireos, warblers, and other small birds. Early in the morning she furtively enters the nest of her victim and lays one of her eggs, selecting a different nest for each of her eggs, and sometimes several female cowbirds lay in the same nest. Most small birds do not object to the cowbird's eggs, but some species desert their nest or, in the case of the yellow warbler, build a second nest on top of the first one, thus burying the cowbird egg (along with some of its own) in the floor of the nest. The rightful young of the nest often starve, for the young cowbird, having a more voracious appetite and a faster rate of growth, deprives them of their food. The other species of cowbirds are found chiefly in the American tropics. The giant cowbird (*Psomocolax*) lays its eggs in the long hanging nests of the tropical orioles known as oropendolas. The latter try to drive away the cowbird, but she eventually sneaks into the nest and lays one of her eggs.

Consult Friedman, Herbert, *The Cowbirds* (Springfield, Ill., 1929).

DEAN AMADON,
Associate Curator, Department of Birds, The
American Museum of Natural History.

COWBOYS, in the American Revolution, a band of American Tories who infested the neutral ground of Westchester County, N. Y., robbed Whigs and Loyalists, and made a specialty of stealing cattle. A similar band of marauders

on the British side received the name of Skinners.

The word cowboys is now used to designate the men who have charge of the cattle on the vast ranges in the west and southwest of the United States. A number of them were enlisted in two regiments of cavalry for the war with Spain and, under the popular name of Rough Riders, greatly distinguished themselves in the early part of the campaign against Santiago in Cuba.

COWDENBEATH, kou-d'n-bèth', burgh, Fifeshire, Scotland. About 18 miles northwest of Edinburgh, it is an important mining center. Here the Solemn League and Covenant was drafted about 1642. Pop. (1951) 13,153.

COWELL, kov'el, **Edward Byles**, English Sanskrit scholar: b. Ipswich, England, Jan. 23, 1826; d. Cambridge, Feb. 9, 1903. He was educated at Oxford and was for some years principal of the Sanskrit College, Calcutta, India. From 1867 he was professor at Cambridge University and was ranked as the foremost English Orientalist of his day. His association with Edward Fitzgerald, the translator of Omar Khayyám, made him an important figure in English literature. He published a great number of works in both Sanskrit and English, and translated many religious works from Sanskrit into English. His *Life and Letters* were edited by his relative George Cowell (Oxford 1904).

COWEN, kou'en, **SIR Frederic Hymen**, English composer and conductor: b. Kingston, Jamaica, B. W. I., Jan. 29, 1852; d. London, England, Oct. 6, 1935. He was brought to England at an early age and studied music under Sir Julius Benedict and Sir John Goss. He published his first composition when he was six years old. From 1888 to 1892, and from 1900 to 1907, he conducted the Philharmonic Society, holding many musical posts in the interim and subsequently. His best-known works include *Pauline*, an opera (1876); six symphonies, the chief being No. 3 (Scandinavian, 1880), No. 4 (Welsh, 1884), and No. 6 (Idyllic, 1897); the cantatas, *The Corsair* (1876), and *The Sleeping Beauty* (1885); and four English dances (1881). He composed over 300 songs, duets, piano pieces, and oratorios. In 1911 he was knighted and in 1913 he published an informal autobiography, *My Art and My Friends*.

COWEN, **Joseph**, English statesman and journalist: b. Blaydon-on-Tyne, England, July 9, 1831; d. Newcastle-upon-Tyne, Feb. 18, 1900. Educated at Edinburgh University, he became a passionate foe of oppression at an early age. His close ties with Giuseppe Mazzini, Lajos Kossuth, Aleksandr Ivanovich Herzen, and Giuseppe Garibaldi, as well as his outspoken support of the Chartists and the Irish Nationalists, brought him into opposition with most of the leading English political figures of the day. In 1886 he retired from Parliament, where he had served in the House of Commons as a Liberal member from 1873, to devote himself to writing and speaking. He was renowned as an orator, speaking strongly for Home Rule for Ireland before that cause was supported by Cecil John Rhodes and William Ewart Gladstone. Through his newspaper the Newcastle *Daily Chronicle*, and his monthly *Northern Tribune*, he wielded strong

influence in northern England for the causes which he so uncompromisingly supported.

COWES, kouz, seaport, England, located on the north coast of the Isle of Wight, 10 miles west-southwest of Portsmouth. The Medina River separates East Cowes from West Cowes. In 1540 Henry VIII erected here a castle which since 1856 has been the headquarters of the Royal Yacht Squadron. Outside Cowes, which is mainly a resort, is Osborne House, long a favorite residence of Queen Victoria. Pop. (1951) 17,916.

COWHAGE, kou'ij, **COUHAGE**, **COW-AGE**, or **COWITCH**, a plant (*Stizolobium pruritum*) belonging to the pea family (Papilionaceae). It is a twining annual with large racemes of dark-colored flowers, which in India appear in the rainy season. The pod, shaped like the letter *s*, is covered with delicate bristlelike spines, which are easily detached and, sticking in the skin, produce an intolerable itching. In India these spines are mixed with sirup and used as a vermifuge, the spines acting mechanically. When young, the pods are cooked and eaten like string beans.

COWHIDE. See **LEATHER AND SHOE TRADE TECHNICAL TERMS—Cowhide**.

COWL, koul, **Jane** (nee **COWLES**), American actress: b. Boston, Mass., Dec. 14, 1884; d. Santa Monica, Calif., June 22, 1950. After studying at Columbia University she made her Broadway stage debut in *Sweet Kitty Bellairs* (1903). Among the plays in which she starred were *Within the Law*, *Common Clay*, *Romeo and Juliet*, *The Road to Rome*, *Rain From Heaven*, *Old Acquaintance*, and *Camille*. She was also co-author of, and appeared in, *Daybreak*, *Information Please*, *Smilin' Through*, and *Lilac Time*. A great actress, she was called by the critics of her time the most beautiful woman on the American stage.

• **COWLES**, kôlz, **Henry Chandler**, American botanist: b. Kensington, Conn., Feb. 27, 1869; d. Chicago, Ill., Sept. 12, 1939. A graduate of Oberlin College, he received his doctorate in philosophy from the University of Chicago in 1898 and taught there from 1902 until 1934. He wrote *Plant Societies of Chicago* (1901) and *Textbook of Plant Ecology* (1911) and was editor of the *Botanical Gazette* (1925–1934).

COWLEY, kou'li, **Abraham**, English poet: b. London, England, 1618; d. Chertsey, Surrey, July 28, 1667. He so early imbibed a taste for poetry that in 1633, while yet at school, he published a collection of verses, entitled *Poetical Blossoms*. In 1637 he was elected a scholar of Trinity College, Cambridge, where he soon obtained a great literary distinction, and published in 1638 a pastoral comedy, entitled *Love's Riddle*, and another in Latin, called *Naufragium Jocularé*, acted before the university by the members of Trinity College. He was ejected from Cambridge as a Royalist in 1644 and went to St. John's College, Oxford, where he published a satirical poem entitled the *Puritan and the Papist*. He engaged actively in the royal cause, and when the queen was obliged to quit England, Cowley accompanied her. In 1656 he returned to Eng-

land, where he published an edition of his poems, containing *Miscellanies*, *The Mistress*, *Pindarique Odes*, and the never-finished epic, *Davidis* (on the history of King David). He again visited France, and resumed his functions of agent in the royal cause on the death of Oliver Cromwell. At the Restoration he returned with the other Royalists. By the interest of the duke of Buckingham and the earl of St. Albans he obtained the lease of a farm at Chertsey, whither he retired in 1665. In 1660 Cowley took part in founding the Royal Society; in 1661 he published *A Proposition for the Advancement of Experimental Philosophy*; and *Vision Concerning . . . Cromwell the Wicked . . .*, which is one of the best of his prose works. He published two books of a Latin poem on plants in 1662; he afterward added four more books, and the whole, together with other pieces, was published in 1678 under the title of *Poemata Latina*. A poem *On the Civil War* appeared in 1679; his *Select Works* were published in 1772.

Cowley was extremely popular in his day, and his style, both in prose and verse, has been highly commended by critics; but his poems have failed to maintain their earlier popularity. The wit for which they once were celebrated has become obsolete, and he is now little read; but Charles Lamb spoke highly of him as a poet and William Hazlitt praised him as a prose writer. Good modern editions of his works are *The Complete Works in Verse and Prose of Abraham Cowley*, ed. by A. B. Grossart, 2 vols. (Edinburgh 1881), and *The English Writings of Abraham Cowley*, ed. by A. R. Waller, 2 vols. (Cambridge 1905–1906).

Consult Nethercot, A. H., *Abraham Cowley* (Oxford 1931).

COWLEY, Hannah (nee **PARKHOUSE**), English poet and dramatist: b. Tiverton, Devonshire, England, 1743; d. there, March 11, 1809. Challenged, after her remark at a tedious play that she could do better, she finished *The Runaway* in a fortnight; it was produced in 1776 by David Garrick and became an instant success. Of her many subsequent successes the best known are *The Belle's Stratagem* (1782), *A Bold Stroke for a Husband* (1783), *More Ways Than One* (1784), and *The Town Before You* (1795). As one of the Della Cruscan (q.v.) she contributed verse to the *World*; a great deal of this was of such a sentimental nature that her pseudonym, Anna Matilda, has become a byword for mawkishly emotional writing.

COWLEY, Malcolm, American writer and editor: b. Belsano, Pa., Aug. 24, 1898. His first book, *Blue Juanita*, a collection of verse, was published in 1929, followed by *Exile's Return* (1934) and *The Dry Season* (1941). He was literary editor of the *New Republic* (1929–1944) and has been a contributor to numerous periodicals. His translations from the French include Paul Valéry's *Variety* (1926) and André Gide's *Imaginary Interviews* (1944). He is the editor of *The Portable Hemingway* (1944), *The Portable Faulkner* (1946), *The Portable Hawthorne* (1948), *The Complete Whitman* (1948), *The Stories of F. Scott Fitzgerald* (1951).

COWLEY FATHERS. See **ORDERS, RELIGIOUS—Anglican Orders** (Saint John the Evangelist, Society of).

COWPEA, kou'pé, an annual plant (*Vigna sinensis*) of the family Leguminosae, native originally to central Africa and introduced into the American colonies in the early 18th century. In appearance it resembles garden and field beans, since it produces trifoliate leaves and bears its seeds in long, slender, beanlike pods. Because the plants are very sensitive to frost, in the United States they are grown only in the South. With the rise of the soybean, with which it competes, the cowpea has declined in importance.

Thirteen states are responsible for most of the cowpea acreage in the United States. In 1953 these states grew an estimated 318,000 acres for peas, 254,000 acres for hay, and 467,000 acres for pasture or plowing under to enrich the soil. The total acreage of 1,039,000 is small when compared with the total United States soybean acreage of 16,510,000 for the same year. Several Southern states prefer the cowpea to the soybean, however, and grow considerably greater acreages of the former. The principal cowpea-producing states are Texas, South Carolina, Georgia, North Carolina, Oklahoma, Mississippi, and Alabama.

The cowpea plant has what botanists call an indeterminate type of growth, meaning that it continues to grow until frost. (The soybean, on the other hand, has a determinate type of growth, flowering, producing seed, and stopping growth after maturity.) The cowpea is therefore desirable for hay, grazing, and plowing under in the South, where the long growing season makes possible a long period of usefulness.

About one third of the United States crop is grown for seed production, and most of this is used for human food and seed for planting. The peas for food are harvested as green pods, green beans to be canned, and dry beans. Average yields, ranging from 5.5 to 6.5 bushels per acre, are so low compared with those of soybeans that the cowpea does not compete with the soybean for dry bean production for animal use.

For many years Southern farmers have used the cowpea for soil enrichment, since its heavy growth of nitrogen-rich foliage is excellent for replenishing depleted soils. Nevertheless, the trend has been toward the use of other types of legumes for this purpose, since the cowpea is comparatively less economical when all factors are considered.

Like other crops, the cowpea is subject to disease and insect attack. A wilt disease usually causes most damage when it appears. Bean rust is another disease of some importance. Nematodes do great damage in some areas and the bollworm often attacks the crop, especially in late summer. The best means of controlling diseases and insects is to practice crop rotation and clean cultivation. Some work has been done to develop disease-resistant varieties. The principal varieties grown in the United States are Black, Brabham, Clay, Groit, Iron, Monetta, Ripper, New Era, Taylor, and Whippoorwill.

Consult Mone, W. J., *Cowpeas: Culture and Varieties*, Farmers' Bulletin No. 1148, rev., U.S. Dept. of Agriculture (Washington 1924).

COWPENS, kou'pénz, locally küp'énz, town, South Carolina, in Spartanburg County, near the North Carolina line, is located nine miles east-northeast of Spartanburg, on the Southern Railway. The manufacture of textiles is the chief

industry. Others include machinery and food products. Nearby is Cowpens National Battlefield Site, established in 1929 to mark the victory gained Jan. 17, 1781 by American forces under Brig. Gen. Daniel Morgan over a British division under Lieut. Col. Banastre Tarleton. Cattle pens here gave the town its name in the 1700's. It is governed by a mayor and council. Pop. (1950) 1,879.

COWPENS, Battle of, in the American Revolution, Jan. 17, 1781. At the end of 1780 Lord Charles Cornwallis held South Carolina with a little over 3,000 men, having lost about 1,100 with Maj. Patrick Ferguson two months before, at Kings Mountain. Waiting for reinforcements, he lay at Winnsborough, north of the center, within supporting distance of Fort Motte and Orangeburg in the center, Charleston and Georgetown on the coast, and Augusta and Ninety-Six in the west. In December, Maj. Gen. Nathanael Greene entered the state with only 2,000 men, but with several subordinate leaders fit for separate commands. With 1,100 men he occupied Cheraw Hill in the northeast and kept Cornwallis in alarm for his communications with the coast. Under Brig. Gen. Daniel Morgan he sent 9,000 men (part militia, part regulars) to join the victors of Kings Mountain and to alarm Cornwallis for the western posts. Cornwallis moved north into North Carolina to force a like movement on Greene and sent Lieut. Col. Banastre Tarleton with 1,100 men after Morgan.

The Americans took post in a pasture ground called the Cowpens, near the northern boundary, a few miles southwest of Kings Mountain and just west of Broad River. A long slope led to a low rise; then came a depression, succeeded 150 yards farther by another rise; and in rear of this was the river, cutting off retreat. Morgan's move was in violation of all military rules, but he was a man of genius and used to militia; he said that he could ask but one thing better—and that was to have them entirely surrounded by the enemy, so that they could not run. Tarleton came in sight on the morning of Jan. 17, 1781, and Morgan placed his militia 150 yards in front of the first hill, with injunctions to fire at least two volleys at close range before breaking; on the hill, the famous 1st Maryland regulars, with some fine Virginians; on the second hill, his cavalry under Col. William Washington, a second cousin of George. As the British closed, the militia did not break; they were under Col. Andrew Pickens and fired many more than the two volleys with destructive effect. Finally forced back, they retired to the left around the hills to the river bank, in rear of the cavalry, to reform. The British left stretched around to flank the right of the American regulars, who withdrew to face them; the British thought them retreating and hurried forward in some disorder. Just then Colonel Washington's cavalry charged around the two hills to the left, coming up to the militia's old position and taking the British in rear, with the river on their flank; the militia rushed around the hills to the right, taking them in flank on the left; and the Continental regulars, only 30 yards off, poured in a withering fire and charged with bayonets. Hannibal himself neither wrought a finer piece of tactics nor caught an enemy in a deadlier trap. Most of the British troops threw down their arms; the remnant fled with Tarleton, who barely escaped being cut down

by Colonel Washington's saber. Of the British 270 were killed or wounded and 600 were captured, with 2 fieldpieces and 1,000 small arms. The Americans lost 12 killed and 62 wounded. Nearly a third of Cornwallis' army, including all his light troops, were annihilated at a blow.

COWPER or COOPER, kōō'pēr, William, English anatomist and surgeon: b. Petersfield, Sussex, England, 1666; d. London, March 8, 1709. Considered the foremost anatomist of his time, Cowper gave a classic description of aortic insufficiency and made valuable contributions to the study of muscles. However, he is remembered chiefly for the first satisfactory description of the bulbo-urethral glands, which later were called Cowper's glands. He was the author of *Myotomia Reformata* (1692), *The Anatomy of Humane Bodies* (1698), and *Glandularum . . . Descriptio* (1702).

Consult Cole, F. J., *History of Comparative Anatomy: From Aristotle to the Eighteenth Century* (New York 1944).

COWPER, William, 1ST EARL COWPER, English jurist: b. about 1665; d. Hertfordshire, England, Oct. 10, 1723. Called to the bar in 1688, he served in the House of Commons from 1695 until he was made lord keeper of the great seal in 1705. He played a leading role in the union of Scotland with England (1706) and was the first lord chancellor (1707-1710). He left office with the Whigs in 1710, when their unpopularity reached its peak at Dr. Henry Sacheverell's trial, at which Cowper presided. Under George I he became again lord chancellor (1714-1718) and was created (1718) Viscount Fordwich and Earl Cowper. Although he gave ill-health as his reason for retirement (1718), political intrigue was more probably the cause. Cowper's contemporaries considered him a consummate orator in parliamentary debate. Cowper's private diary, edited by E. C. Hawtrey, was published in 1844.

COWPER, William, English poet: b. Great Berkhamstead, Hertfordshire, England, Nov. 15, 1731; d. East Dereham, Norfolk, April 25, 1800. At 10 he entered Westminster School and showed fondness for athletics and literary studies; but he also displayed some morbidity, particularly in religious matters. After eight years at Westminster and nine months at home, he was articled for three years to a London solicitor. Later he described these and the following 12 years as misspent, meaning that he thought little about the state of his soul and enjoyed visiting the three attractive daughters of his uncle, Ashley Cowper. In 1752 he took chambers in the Middle Temple. He was called to the bar in 1754, but made few efforts to secure clients, his conduct being partly explained by the fact that in 1753 he was afflicted with a sort of mental dejection that for many months paralyzed his energies. Finally, after he had received consolation from George Herbert's poetry and had had his "hard heart" softened by prayer, a visit to the seashore completed a temporary cure.

In 1756 his father died; the same year his suit for the hand of his cousin, Theodora Cowper, was rejected by his uncle. She remained true to him, and shortly after her death the love poems which he wrote to her were published (1825). Cowper does not appear to have been

inconsolable. In 1759 he bought a suite of chambers in the Inner Temple and was made a commissioner of bankrupts, at which time he habitually spent more than his income. In his pecuniary stress he obtained from his cousin, Maj. William Cowper, the gift of the patent office of clerk of the journals of the House of Lords. But his kinsman's right to bestow the post being questioned, it was decided that Cowper's fitness must be tested by an examination. He broke down in his preparation for this and, as the ordeal drew near, grew more and more despondent. Finally he made three vain attempts to commit suicide (November 1763). The idea of his securing the office had to be abandoned, and a few weeks later he was placed in the private asylum kept at St. Albans by the poet-physician, Dr. Nathaniel Cotton.

After about five months he began to improve. He continued at the asylum, however, until June 1765, when he removed to Huntingdon, resolving to break away forever from his former life. He became practically a recluse, but he had acquired the urbanity which was to be so marked a characteristic of his poetry and of his correspondence.

In Huntingdon Cowper began his famous friendship with the family of the Rev. Morley Unwin, particularly with the latter's pious wife (Mary Cawthorne) and his son, later the Rev. William Cawthorne Unwin. They took Cowper as a boarder, and at last his religious aspirations were satisfied. Every day was spent in attending church twice, in singing hymns, and in reading and conversing on evangelical topics.

In the summer of 1767 the elder Unwin was killed in a fall from his horse. John Newton, curate of Olney, persuaded Mrs. Unwin and Cowper to move to that town, which has since been associated with the poet's memory. They took a house called Orchard Side, and Cowper found congenial employment in assisting Newton in his work among the poor and in writing hymns. In 1770, on the death of his brother John, Cowper wrote *Adelphi* (published 1802), an account of that clergyman's conversion to evangelical tenets. Two years later he and Mrs. Unwin became engaged, but all thoughts of marriage were soon dispelled by Cowper's third derangement, which began in January 1773 and lasted until May 1774. After a terrible dream in February 1773, he seems never to have been able to believe for long that there was any hope of his salvation. Yet, when he had outwardly recovered, he strove not to exert a depressing influence on others and he took much pleasure in keeping a garden, building his summer house, and describing to correspondents such local events as the Olney fire of 1777. In 1799 Newton published the *Olney Hymns*, of which 68, including *Oh for a Closer Walk with God* and *God Moves in a Mysterious Way*, were by Cowper. Later in the same year Newton accepted a rectory in London. Whether his intense nature had oppressed Cowper's mild genius is a moot point. It is at least certain that the latter's literary career commenced in full after Newton had left Olney.

Under the encouragement of Mrs. Unwin, Cowper began to work steadily upon a series of didactic, semisatiric poems—*Progress of Error*, *Truth*, *Table Talk*, and *Expostulation* (December 1780-February 1781). Newton acted as a friendly critic and secured a publisher for the volume, which, with the addition of *Hope*, *Charity*, *Com-*

versation, Retirement, and some shorter pieces, appeared in February 1782 and was moderately successful. Time has shown not only that it contained many apt passages of observation and reflection, but that it heralded a departure, not too violent, from the overpolished style and somewhat metallic versification of Pope.

Meanwhile, the poet had made the acquaintance of Lady Austen, a baronet's widow who was visiting near Olney. The intimacy, which Mrs. Unwin shared, became too intense to last more than a few years; but, whatever Lady Austen's disappointments, we owe to them two of Cowper's best poems—the humorous ballad of *John Gilpin* (1782), based on a story which she told Cowper to dispel his melancholy, and *The Task*, his great discursive poem in blank verse, which, beginning with Lady Austen's theme, the sofa, broadened into reflections upon life and descriptions of nature unrivaled in their day and in respect to realistic fidelity and homely charm not clearly surpassed since. *The Task* was probably begun in July 1783 and was finally published in June 1785, along with *John Gilpin* (which had been circulated in periodicals), the admirable *Epistle to Joseph Hill*, and *Tirocinium*, a satire upon current education (1782–1784). Cowper meanwhile had begun his translation of the *Iliad* in blank verse and had written some of his shorter poems like *The Poplar Field*. All this time he believed firmly that God had abandoned him and that it was his duty not to pray, since that would imply a questioning of the righteousness of the divine decree.

The Task, helped by the vogue of *John Gilpin*, attained success. Cowper became the chief poet of the day and secured a popularity which lasted well into the next century. His relatives began to pay more attention to him, and in Lady Hesketh, sister of his former love Theodora, and the Rev. John Johnson, of Norfolk, he found supporters during the trying years which were in store for him. His income was increased, and with Lady Hesketh's aid he and Mrs. Unwin moved from Olney to the neighboring Weston in November 1786. Shortly afterward they were shocked by William Unwin's sudden death. At that time Cowper suffered his fourth derangement, which lasted from January to June 1787. He recovered rather speedily and worked at Homer, wrote excellent short poems, and resumed his correspondence, while continuing to suffer from hallucinations and melancholia. In September 1788 he began translating the *Odyssey*, and the complete Homer, including the *Batrachomyomachia*, was published by subscription in July 1791 with a success which time has not ratified. Posterity much prefers the pathetic lines *On the Receipt of My Mother's Picture out of Norfolk*, written in the spring of 1790. Having been assured by a demented schoolmaster-friend named Teedon that heaven was willing, Cowper undertook to edit an elaborate edition of his favorite, Milton. The scheme came to little, but it was the occasion of his forming a warm friendship with his future biographer, William Hayley, to whom he paid a visit in August 1792, accompanied by Mrs. Unwin, who had been partly incapacitated by paralysis. Mrs. Unwin's health sank steadily, and Cowper, in a sad state himself, became in his turn the indefatigable nurse. The lines *My Mary* commemorate the melancholy situation. In January 1794, Cowper was seized with his old complaint and sank into a stupor, from which

he practically never rallied. He did not appreciate the fact that he had been granted a pension of £300 by the government. Mrs. Unwin also grew worse, and but for the ministrations of Lady Hesketh, Hayley, and John Johnson, the last six years of Cowper's life would have been a stretch of unrelieved gloom. In July 1795, Johnson removed the two invalids to Norfolk. They settled finally at East Dereham, where on Dec. 17, 1796, Mrs. Unwin died, the event producing little emotion in the man who loved her. Cowper continued in his state of dejection, though he could still work at the revision of his *Homer*. His only important original composition during the period was the poignantly pathetic *Cast-away*, written March 20, 1799. He still persisted in believing that God had forsaken him, and in this belief he died April 25, 1800. He was buried in East Dereham Church beside Mrs. Unwin.

Cowper's importance as a precursor of Wordsworth as well as the positive excellence of many of his descriptive and satiric passages and of his humorous and pathetic shorter poems are generally acknowledged. If his range of work were sufficiently taken into account—his heroic odes, his familiar verse, his humorous ballads, his poems of domestic affection, his verses on animals (in which he is almost unrivaled), his reflective lyrics, his satires and his faithful descriptions of quiet life and English nature—he would be ungrudgingly pronounced a great classic. As a correspondent his supremacy is generally allowed.

To his works enumerated above should be added the unpleasant satire *Anti-Thelyphthora* (1781), and *Latin and Italian Poems of Milton* (1808).

WILLIAM P. TRENT,
Late Professor Emeritus of English Literature,
Columbia University.

Bibliography.—The first edition of William Hayley's biography of Cowper, with letters and supplementary material, appeared in four volumes between 1803 and 1806. In 1835 T. S. Grimshawe edited the life and letters in eight volumes. However, Robert Southey's edition of Cowper's works together with his life of Cowper, in 15 volumes (1834–37), is still the standard work. A good modern edition of Cowper's works, containing a bibliography of the earlier editions, is that of H. S. Milford (3d ed., Oxford 1926).

Also consult Bradford, Gamaliel, *Bare Souls* (New York 1924); *Selected Letters*, Everyman Series (London 1926); Fausset, Hugh P., *Anson, William Cowper* (London 1928); Cecil Lord David, *The Stricken Deer* (London 1929); Hartley, L. C., *William Cowper: Humanitarian* (Chapel Hill, N.C., 1938); Thomas, G. O., *William Cowper and the Eighteenth Century*, 2d ed. (London 1949).

COWPOX. See CATTLE, DISEASES OF.

COWRIE or **COWRY**, kou'ri, any snail in the family Cypræidae, a family of marine snails which contains upwards of 300 species, generally highly colored and glossy, considered among the most beautiful of the marine shells. The cowries are confined to tropical and subtemperate regions. A few species are found in the West Indies and the Atlantic coast of Central and South America. A few other species live along the Pacific coast of Central and South America, and in North America, as far north as southern California. The greatest number of the species, however, appear in the tropical portions of the vast Indo-Pacific region.

The Money Cowrie (*Cypræa moneta*) once was used extensively as money, particularly in Africa, and to a less extent in other portions of the world. It still is used in a limited way

in remote sections of Africa as a means of trade. The supply of these cowries came mainly from coral-reef areas of the East Indies.

COWRY BIRD. See NUTMEG BIRD.

COWSLIP, kou'slip, a common name often applied to marsh marigold (*Caltha*), a genus of about 20 glabrous perennials of the cold temperate and arctic regions of both hemispheres, belonging to the crowfoot family (Ranunculaceae). Two species of *Caltha* occur in the eastern United States: *C. palustris*, cowslip or kingcup, with yellow flowers, and the smaller *C. nutans*, with white or pinkish flowers and floating stems, which is rare and local in its distribution. Half a dozen other species are found in the western United States.

Cowslip is also used to two genera of the primrose family (Primulaceae): the primrose (*Primula*) and the American cowslip (*Dodecatheon*). The primroses are low perennial herbs, mostly of boreal or alpine distribution (one or two in southern South America), with single or tufted and simple scapes, and flowers in umbels. The European cowslip (*P. veris* or *P. officinalis*) has large yellow or purple corollas and is often found as an escape from cultivation. Four species of primrose with white, yellow, or lilac corollas are native in eastern North America. *Dodecatheon*, a genus of mostly western species, is represented in the eastern states by the shooting star (*D. Meadia*) with lilac, pink, or violet, showy, nodding flowers, and another species (*D. amethystinum*) with deep red-purple flowers and limited distribution.

COWWHEAT, kou'hwët, a genus (*Melampyrum*) of about 15 species of erect branching semiparasitic annuals of the Northern Hemisphere belonging to the figwort family (Scrophulariaceae), is represented in North America by the highly variable narrowleaf cowwheat (*M. lineare*) and its four varieties. This species may be two feet tall, has white flowers, and black seeds (as indicated by the generic name). It is found in Canadian woods from Labrador to British Columbia, but in the United States mostly in the east from New England to Georgia.

COX, köks, David, English landscape painter: b. Deritend, near Birmingham, England, April 29, 1783; d. Harborne, near Birmingham, June 7, 1859. Drawn to painting as a schoolboy, before the age of 20 he found work as a painter of scenery in English and Welsh theaters. To increase his income after marriage in 1808, Cox taught drawing in schools until 1820 and thereafter took private pupils occasionally. In nearly every year from 1820 until his death Cox took sketching tours in England and especially in Wales. His election to the Society of Painters in Water-colours in 1813 preceded his publication of *A Treatise on Landscape Painting and Effect in Water-colours* . . . (1814). After 1839 he turned more to oils as a medium, in which he did very skillful work, but Cox is remembered mostly for his water-color paintings of Welsh landscapes and is ranked among the best English painters of landscapes. His colors are pure and fresh, his treatment of light and shade is superb, in small productions he excels. Some of Cox's drawings are in the British Museum and the South Kensington Museum, London, others are

in the Birmingham Art Gallery, but his best water-color paintings are in private collections.

COX, SIR George William, English clergyman and historian: b. Benares, India, Jan. 10, 1827; d. Walmer, Kent, England, Feb. 9, 1902. He was educated at Trinity College, Oxford, and was ordained in 1850. After serving several parishes, he became rector of Scrayingham, Yorkshire (1881-1897). In 1877 he succeeded his uncle in the baronetcy. In 1886 he was chosen bishop of Natal by the friends of Bishop John W. Colenso, but the archbishop of Canterbury refused him consecration. Cox was the author of many historical works of popular character, several of which treated the history of Greece and the study of mythology and of folklore. Among his most important published works are *A Manual of Mythology* (1867), *A History of Greece*, 2 vols. (1874), and *The Life of John William Colenso, D.D., Bishop of Natal*, 2 vols. (1888).

COX, Jacob Dolson, American soldier and statesman: b. Montreal, Canada, Oct. 27, 1828; d. Magnolia, Mass., Aug. 8, 1900. After graduating from Oberlin College in 1851, he taught school in Warren, Ohio, for two years, and in 1853 he began the practice of law there. At the outbreak of the Civil War he was made a brigadier general of the Ohio Volunteers. In 1862 he became major general of the United States Volunteers and in 1864 he commanded a division at Nashville. Cox was elected governor of Ohio in 1865, but lost favor with his party over his opposition to Negro suffrage and was not renominated. In 1869 he became secretary of the interior in President Ulysses S. Grant's cabinet. He resigned office in 1870 after differences with Grant about the need for civil service reform, Cox being supported by progressive opinion in general; his political "martyrdom" had, in all likelihood, a hastening effect on the establishment of subsequent reform.

Cox resumed the practice of law, but in 1873 he became the president of the Wabash Railroad. He served one term (1877-1879) in Congress, after which he retired from public life, becoming (1881) dean of the Cincinnati Law School. From 1874 until his death he was military critic for the *Nation*, and his published books and articles earned him a reputation as one of the foremost military historians of his time. Included among his works are *Atlanta, The March to the Sea, Franklin and Nashville*, and *The Battle of Franklin*; his *Military Reminiscences of the Civil War* was published posthumously in two volumes in 1900.

COX, James Middleton, American journalist and statesman: b. Jacksonburg, Ohio, March 31, 1870. Educated in the public schools of Ohio, he was employed in a printer's office, taught in a country school, became a newspaper reporter, and was for a time on the editorial staff of the Cincinnati *Enquirer*. In 1898 he became proprietor of the Dayton *Daily News*, the first of eight newspapers which he eventually owned. He served in Congress from 1909 to 1913 and was governor of Ohio (1913-1915, 1917-1921). In 1920 he was the unsuccessful Democratic candidate for the presidency. In 1933 he served as vice chairman of the United States delegation to the World Monetary and Economic Conference in London. His autobiog-

raphy, *Journey Through My Years*, appeared in 1946.

COX, Kenyon, American painter: b. Warren, Ohio, Oct. 27, 1856; d. New York, N. Y., March 17, 1919. He began the study of art in Cincinnati and at the Pennsylvania Academy of Design. From 1877 to 1882 he worked in Paris under Carolus Duran and Jean Léon Gérôme. Returning to America, he settled in New York City, and embarked on a varied career, painting, illustrating, and writing. He is known principally as a mural painter: decorations by him are in the Library of Congress in Washington, in the state capitol at St. Paul, Minn., and in courthouses in New York, Newark, Jersey City, and Wilkes-Barre. His paintings are on view in many of the large museums of the United States, including the Metropolitan Museum in New York, N. Y., and the National Gallery in Washington, D.C. He was the recipient of various awards, among them the Medal of Honor for Mural Painting bestowed in 1910 by the Architectural League. He was a member of the Society of American Artists, the American Academy of Arts and Letters, and the National Academy. Cox was a writer of artistic criticism as well as a painter; he received the degree of doctor of letters from Oberlin and Dartmouth colleges. Besides numerous reviews and magazine articles, he published six volumes of criticism on art, *Old Masters and New* (1905), *Painters and Sculptors* (1907), *The Classic Point of View* (1911), *Artist and Public* (1914), *Winslow Homer* (1914), and *Concerning Painting* (1917).

Consult Smith, Minna C., "The Work of Kenyon Cox," *International Studio*, vol. 32 (1907); Mather, Frank J., *Kenyon Cox* (New York 1919).

COX, Louise Howland King, American artist: b. San Francisco, Calif., June 23, 1865; d. Windham, Conn., Dec. 10, 1945. She studied art in New York City at the National Academy of Design and at the Art Students' League under Kenyon Cox, whom she married in 1892. In 1900 she received a medal at the Paris Exposition and was the recipient of many other honors. She was a member of the Society of American Artists and was an associate of the National Academy. Louise Cox was especially talented as a painter of children and made many portraits of her own three children. Although she seldom exhibited her work, it is represented in many private collections in the United States and also in the National Gallery of Art in Washington, D.C.

COX, Palmer, Canadian author and illustrator: b. Granby, Quebec, Canada, April 28, 1840; d. there, July 24, 1924. Originally a contributor of cartoons and verse to newspapers in California, where he settled in 1863, Cox first attained success with the publication of *Squibs of California, or Every-Day Life Illustrated* in 1875. In that year he moved to New York and in 1880 began to illustrate stories for *St. Nicholas Magazine*, where his famous "Brownie" series first appeared. In book form his "Brownie" stories sold over a million copies during his lifetime. He also wrote *Hans Von Pelter's Trip to Gotham* (1876), *How Columbus Found America* (1877), and *That Stanley* (1878). Two plays, both written in 1895, were

produced on the stage: *The Brownies in Fairyland*, a cantata in two acts, and *Palmer Cox's Brownies*, a three-act play which ran almost five years.

COX, Richard, English prelate: b. Whaddon, Buckinghamshire, England, 1500; d. Ely, July 22, 1581. Educated at Eton and King's College, Cambridge, he was invited by Thomas Cardinal Wolsey to join his new foundation of Christ Church, Oxford. He is known to have supported King Henry VIII's divorce in 1530, and by 1540 he was one of the 15 divines settling crucial church questions. He was among those who declared the marriage of Henry and Anne of Cleves null and void in 1540. In the same year he became archdeacon, in 1542 prebendary of Lincoln, and in 1547 dean of Christ Church, Oxford. At the accession of Edward VI (1547), Cox advanced rapidly, becoming dean of Westminster Abbey in 1549. His zeal in eradicating all manuscripts, books, and statutes savoring of Romanism while he was chancellor of Oxford (1547-1552) earned him the nickname of "cancellor" of the university.

After the death of Edward (1553) Cox was arrested on suspicion of being engaged in Northumberland's plot to seize power, but he escaped to the Continent, where he lived in exile at Frankfurt on the Main (1555-1559). Here John Knox, under Calvinistic influence, had persuaded adoption of a service far more puritanical than that of the Book of Common Prayer established under Edward VI. Cox opposed such doctrine, and the two factions, which came to be known as Knoxians and Coxians, split the city into rival parties. Although Knox accused Cox of pluralism, the latter charged him in turn with treason against the emperor, Charles V. Knox and his followers were banished from the city, and the Book of Common Prayer was restored.

In 1559, after Elizabeth I's accession, Cox returned to England, where he first was created bishop of Norwich, but shortly thereafter was translated to the see of Ely. He remained there for 21 years, a period marked by his harshness, intolerance, power-seeking, and enmity to Roman Catholics; he refused to serve in the queen's chapel because of the presence of candles and the crucifix. His arbitrary judgments were felt also by Puritans and Protestants, and he was in frequent conflict over his property, much of which he was subsequently forced to cede to his enemies and accusers. The hostility of the court caused him to request permission to resign his see, which he did in 1580, receiving a pension of £200 and the palace of Doddington.

Cox translated the Acts of the Apostles and the Epistle of St. Paul to the Romans for the Bishops' Bible, and assisted in compiling and then in revising the first Book of Common Prayer.

COX, Samuel Hanson, American clergyman and educator: b. Rahway, N. J., Aug. 25, 1793; d. Bronxville, N. Y., Oct. 2, 1880. Originally studying for the legal profession, he abandoned it for the study of theology and was ordained to the Presbyterian ministry in 1817. From 1817 until 1854 he held pastorates in New Jersey and New York; during these years he was outspoken in his antislavery views. As a leader in that movement, he was burned in effigy in Charleston.

S. C. (1835). He was a director of Union Theological Seminary and a founder of New York University. From 1856 to 1863 he was head of Ingham University in New York State. Cox was the author of *Quakerism not Christianity* (1833) and *Interviews, Memorable and Useful* (1853).

COX, Samuel Sullivan, American statesman and author: b. Zanesville, Ohio, Sept. 30, 1824; d. New York, N. Y., Sept. 10, 1889. After graduating with high honors from Brown University in 1846, Cox studied law and was admitted to the Ohio bar, but soon turned to literature and travel. After the publication of *A Buckeye Abroad* (1852), he became editor of the *Ohio Statesman*, where he earned his lifelong nickname "Sunset" after an extraordinarily rhetorical description of a sunset. He served as a Democratic member of Congress from Ohio (1857-1865), and from New York (1869-1873, 1875-1885, 1887-1889). In 1885 he was appointed by President Grover Cleveland as ambassador to Turkey, but resigned after a year. He was called the Letter Carriers' Friend for his efforts in their behalf for better working conditions, and a statue of Cox stands in Astor Place, New York City, erected by the letter carriers. Cox was a religious man of independent mind and a scholar of broad learning. He supported the Civil War, but stood for complete amnesty after its end.

A prolific writer, Cox was the author of a number of volumes of verse, and *Puritanism in Politics* (1863), *Why We Laugh* (1876), *Free Land and Free Trade* (1880), and *Three Decades of Federal Legislation* (1885).

COXALGIA, kōk-sāl'jī-ā, or **COXITIS**, kōks-ī'tis, a term formerly applied to a disease of the hip joint. It is characterized by inflammation, sometimes accompanied by suppuration, which leads to stiffness of the joint and its final destruction by necrosis.

COXE, Arthur Cleveland, American prelate and author: b. Mendham, N. J., May 10, 1818; d. Clifton Springs, N. Y., July 20, 1896. He was the son of Samuel Hanson Cox, but adopted an earlier spelling of the name. He took orders in the Episcopal Church in 1841 and after holding rectorships in Hartford, Conn., Baltimore, Md., and New York City, he was consecrated in 1865 assistant bishop of Western New York, of which diocese he became the bishop later in that year. He was a founder of the Christian Literature Company, for which he edited a series of *Ante-Nicene Fathers* (1885-1886). He published several volumes of ecclesiastical poetry, of which *Christian Ballads* (1840) was the best known and appeared in many editions. His strongly conservative influence was directed toward Christian unity and, through the Anglo-Continental Society, promulgation of the principles of the English Reformation. He wrote books controverting the Roman Catholic interpretation of history and opposed revision of the Bible on the ground that the Authorized Version was a bond uniting many churches. To support this thesis, he published (1857) his *Apology for the English Bible*.

COXE, Tench, American economist: b. Philadelphia, Pa., May 22, 1755; d. there, July

16, 1824. Whether or not Coxe was a Royalist at the time of the Revolution is debatable; however, as a Whig he was a member of the Annapolis Convention in 1786 and of the Continental Congress in 1788. He was assistant secretary of the treasury in 1789 and served (1792-1797) as commissioner of the revenue. After Coxe's break with the Federalists, Thomas Jefferson made him (1803) purveyor of public supplies, which office he held until 1812. He early devoted much attention to political economy, and his writings and ideas on this subject constitute his chief claim to remembrance. He favored the prohibition of the coasting trade to foreign shipping, the importation of foreign goods only in the ships of the country producing them, the special encouragement of the manufacturing industry, and the exemption of raw materials from tariff duties. He urged the South to cultivate cotton and is sometimes called the father of the American cotton industry. An important key to his economic outlook is his pamphlet (1787) *An Enquiry Into the Principles on Which a Commercial System for the United States of America Should be Founded*. A compilation of his papers, *View of the United States*, was published in 1794.

COXE, William, English traveler and historian: b. London, England, March 7, 1747; d. Bemerton, Wiltshire, June 8, 1828. He was educated at King's College, Cambridge, and in 1771 was ordained and took the curacy of Denham. He soon resigned to become the tutor of several young noblemen and spent many years traveling about the Continent with them; his accounts of these travels and his series of memoirs of 18th century figures are his chief claim to recognition. He published accounts of his travels in Switzerland, Poland, Russia, Sweden, and Denmark, these being translated into most of the languages of Europe. His most important works include *Memoirs of Sir Robert Walpole*, 3 vols. (1798); *History of the House of Austria . . . from 1218 to 1792*, 2 vols. (1807); *Memoirs of Horatio, Lord Walpole*, 2 vols. (1808); *Memoirs of the Bourbon Kings of Spain . . . from 1700 to 1788*, 3 vols. (1813).

COXEY, kōk'sī, Jacob Sechler: b. Selinsgrove, Pa., April 16, 1854; d. Massillon, Ohio, May 18, 1951. Leader in 1894 of the famous march of unemployed on Washington, D.C., he remained throughout his long lifetime one of the nation's most colorful personalities.

Educated in public schools at Danville, Pa., by 1881 he had established at Massillon a sandstone quarry which he operated until 1929. In 1894, amid the economic unrest which followed on the heels of the panic of 1893, Coxe organized a "living petition" of unemployed who marched as the Army of the Commonweal of Christ from Massillon, Ohio, to Washington, D.C., to petition the enactment of remedial legislation. In a parade down Pennsylvania Avenue on May Day, 1894, fewer than 500 Coxeites participated, and their leader was arrested for trespassing while delivering a speech from the Capitol steps. Perennially a candidate for public offices ranging from mayor to president of the United States, he was elected only once, serving as Republican mayor of Massillon from 1931 to 1933. He was the author of *Coxey's Own Story* (1914).

COXIE or **COXCIE**, kōk'sē, **Michiel van**, Flemish painter and engraver: b. Mechlin, Belgium, 1499; d. there, March 5, 1592. His works were long concealed under the signature M.C.O.-K.X.I.N., which accounts for variations in the spelling of his name. He was a pupil of Bernard van Orley and traveled to Rome, where he remained for several years, attracted by the work of Raphael, whom he probably knew personally. Here he executed many paintings in fresco and painted in the style of Raphael the *History of Cupid and Psyche*, which was engraved on 32 copperplates. In the Imperial Gallery in Vienna there is a *Madonna with the Infant Jesus* by him. He was appointed court painter by Philip II of Spain and was commissioned to copy the altarpiece of the brothers Van Eyck in Ghent. He painted in a cold but clearly defined style, and there are good examples of his work in the museums of Madrid, Vienna, Prague, Brussels, and Antwerp, but his works are rare even in the Netherlands.

COXITIS. See **COXALGIA**.

COXSWAIN or **COCKSWAIN**, kōk's'n or kōk'swān, a minor officer on board a ship, who commands a boat's crew in the absence of superior officers and usually steers the boat. The term also designates the helmsman of a racing crew.

COYOTE, kī'ōt or kī-ōtē, prairie wolf (*Canis latrans*), native to the western United States, and before the advent of civilization numerous as far east as the extent of the prairies of the Mississippi Valley, where it was called the red wolf in distinction from the large gray or timber wolf. It is abundant in open country from Alaska and British Columbia south to Central America. Coyotes are smaller than other wolves, being about the size of setter dogs, and, although they often travel in packs, as do other wolves, they are cowardly where man is concerned and confine their raids to the brute creation. Their fur is soft, reddish or tawny-gray in color, sometimes slightly tipped with black. The tail is bushy, the ears are upright, and the slender muzzle is very pointed. Coyotes live in hollows among rocks or in deserted burrows, whence they usually issue at dusk to hunt. Their food is chiefly gophers, mice, ground-nesting birds, prairie dogs, rabbits, sheep, and goats. Their depredations on cattle ranches are mainly reserved for winter. In former days they were persistent enemies of the pronghorns. They are fleet footed, and cunning in avoiding snares. They adapt themselves readily to varying conditions.

COYPEL, kwā'pēl, a celebrated family of French artists.

NOËL COYPEL: b. Paris, France, Dec. 25, 1628; d. there, Dec. 24, 1707. After he had embellished, by the royal command, the Louvre with his paintings (from the cartoons of Charles Le Brun) and had in like manner adorned the Tuileries, Fontainebleau, and Versailles, he was appointed director of the French Academy in Rome (1672). His chief works are the *Martyrdom of Saint James* (in the Cathedral of Notre Dame), *Cain Murdering His Brother* (in the Louvre), the *Trinity and the Conception of the Holy Virgin* (in the Hôtel des Invalides). He

became director of the Royal Academy of Painting and Sculpture in 1695.

ANTOINE COYPEL, his son: b. Paris, France, April 11, 1661; d. there, Jan. 7, 1722. At the age of 20 he was elected to the Royal Academy of Painting and Sculpture; in 1707 he became professor there and in 1714 its director. He was made painter to the king in 1716 and painted many pictures for the royal palaces and the churches of Paris. Among his best works are 12 subjects from the *Aeneid*, a portrait of Molière, and *Jugement de Paris*. The designs of the *Histoire numismatique du règne de Louis XII'* are mostly his. His collected lectures were published under the title *Discours sur la peinture* (1721).

NOËL NICOLAS COYPEL: b. Paris, France, Nov. 18, 1690; d. there, Dec. 14, 1734. He excelled in mythological painting. His best-known pictures are the paintings in the Chapel of the Virgin at the Church of St. Saviour. He became a member of the Royal Academy of Painting and Sculpture in 1720, professor there and court painter in 1731.

CHARLES ANTOINE COYPEL, etcher, painter, and dramatist, son of Antoine: b. Paris, France, July 11, 1694; d. there, June 14, 1752. He studied with his father. At court his dramas made him very popular, especially *Les folies de Cardenio* (1720). His 25 pictures from the history of *Don Quixote* (at the Palace of Compiègne) were very well known. He painted in pastel and also numerous portraits. In 1715 he was admitted to the Royal Academy of Painting and Sculpture, became professor there in 1722, chief court painter in 1747, and director of the academy in the same year.

Consult Pierre Marcel, *La peinture française au début du XVIII^e siècle* (Paris 1906).

COYPU, koi'pōō, or **NUTRIA**, nū'trī-ā, an aquatic rodent (*Myocastor coypus*), native to South America from Peru southward. It is known colloquially as the nutria and its pelt furnishes the fur commercially used in hats and coats. It is dull brown, has a gray muzzle and yellow incisors. Its nostrils are so set that it can breathe when all immersed except the top of its nose. It is somewhat smaller than the beaver and has a slender, ratlike tail. It is distinctly aquatic, dwelling in ponds, and burrowing into the banks or building platform nests among the reeds on the shore. Owing to the threatened extermination of the coypu, local laws have been enacted for its protection as a valuable fur-bearing animal. In the 1930's coypus were imported into the United States, where they abound in the southwest and are important in the fur industry.

COYSEVOX, kwāz-vōks', **Antoine**, French sculptor: b. Lyon, France, Sept. 29, 1640; d. Paris, Oct. 10, 1720. He studied with Louis Lerambert, was admitted to the Royal Academy of Painting and Sculpture in 1676, was employed by Louis XIV in decorating Versailles and Marly. Among his best works are an equestrian statue of Louis XIV; the statue of Jules Cardinal Mazarin; the tomb of Jean Baptiste Colbert; the *Crouching Venus*; the *Nymph of the Shell*; and the *Hamadryad*. He did portrait busts and statues of Louis II de Bourbon, prince de Condé; François de Salignac de la Mothe-Fénelon; Jean Baptiste Racine; Charles Le Brun;

and Marie Thérèse. His work may be seen in Paris at the Louvre, the Tuileries, and various churches, at Versailles, and elsewhere.

COZAD, kô-zăd', city, Nebraska, in Dawson County; altitude 2,487 feet; on the Platte River; 50 miles west of Kearney; on the Union Pacific Railroad. It calls itself "the alfalfa shipping center of the world." Irrigation siphon tubes are made here. Founded in the early 1870's by an Ohioan, John J. Cozad, it was incorporated in 1905. Pop. (1950) 2,910.

COZENS, kûz'nz, John Robert, English water-color painter: b. London, England, c.1752; d. c.1799. A pupil of his painter father, Alexander Cozens (d. 1786), a reputed natural son of Peter the Great by an Englishwoman of Delftford, Cozens visited Switzerland and Italy in 1776 with Payne Knight, and in 1782 toured Italy with William Beckford, for whom he executed many wash paintings. He was the first English water-color painter to sketch in Italy and the Alps. He suffered a mental collapse in 1794, from which he never recovered. Among his English subjects are some fine studies of trees in Windsor Forest. Painting first in monochrome, he later widened his color range. A forerunner of the Impressionists, his handling of composition departed from traditional practice, and his treatment of light was highly sensitive. John Constable paid tribute to the poetic quality of his work, and Joseph M. W. Turner acknowledged an important debt to Cozens' oil painting of Hannibal's march over the Alps (1776). Examples of Cozens' work may be seen at the Victoria and Albert Museum and the British Museum.

COZUMEL, kô'sô-měl', island, Caribbean Sea. Located off the northeast coast of Quintana Roo territory, Mexico, at latitude 20° 34' N. and longitude 86° 44' W., it is 29 miles long and 9 miles wide. It is low, tree-covered, and fertile, and abounds in fruit and cattle. Many remains of ancient Maya buildings have been discovered on it. When Juan de Grijalva visited it in 1518 it contained a large population, and was regarded as a place of peculiar sanctity by the Indians of the neighboring continent.

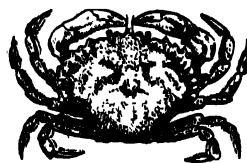
CRAB, a common name applied to the short-tailed (brachyurous) decapod (ten-legged) crustaceans. The head, provided with short feelers, two stalked eyes, and feeding appendages around the mouth, is inseparably fused with the thorax into one piece, the cephalothorax, covered with a hard shell (carapace) whose sides conceal the gills. In typical crabs the cephalothorax is square across the front and wide from side to side. The thorax bears five pairs of legs, the first pair of which usually terminate in large defensive claws (chelae). The outstanding feature of brachyurous crustaceans is the greatly reduced abdomen or tail kept folded out of sight under the thorax. The sexes are easily distinguished by external features. The female fastens her eggs to the under side of her abdomen, where they form a protruding mass called the sponge. This hatches in about two weeks to a minute larva (zoea) having no resemblance to a crab. After several molts the zoea becomes another strange larval type, the megalops, which molts into a tiny crab. Growth to the adult

stage involves a large number of molts, extending over about a year.

Most crabs are marine, inhabiting more or less rocky bottom, where they live in burrows or retreats in the rocks. They run about at night on the tips of their legs, seeking food, mostly animals. The sidewise locomotion is characteristic. In some the last pair of legs is broadened for swimming. Fresh-water crabs live in streams in tropical and subtropical countries. The tropics also abound in land crabs, which live in burrows in sandy shores and mud flats, and run about at night in search of food. Among these is the ghost crab of the Atlantic coast. Land crabs go down into the water to hatch their eggs, as they have the same aquatic larvae as other crabs.

The common edible crab or blue crab (*Callinectes sapidus*) of the Atlantic coast is a swimming crab, whereas the Pacific and European edible crabs of the genus *Cancer* lack swimming capacity. Soft-shelled crabs are obtained for the market by capturing crabs about to molt and keeping them in floats until the old shell is shed; the new shell remains soft for several hours.

Among other types of crabs are the spider crabs, which have distinctively long legs and a smaller triangular cephalothorax with pointed head end. These include the giant spider crab of Japan with legs about three feet long. Spider crabs do not burrow but live mostly among



Crab (*Cancer irroratus*).

seaweeds, and many have the habit of fastening seaweeds, sponges, and other organisms to their backs as a means of concealment. The fiddler crabs (*Uca*) are distinguished by their single, relatively large chela, found only in the male sex. The oyster or pinnotherid crabs generally live inside bivalves and other animals, clinging to the gills, on which they inflict some damage, and robbing the host of food. The box crab is a thick-shelled crab of the genus *Calappa*. Some other marine crustaceans called crabs, such as hermit crabs and mole crabs, are not true crabs, but belong to the anomorous decapods.

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L. H. HYMAN,
Department of Living Invertebrates, American
Museum of Natural History.

CRAB APPLE or **CRAB**, a common name for various native American and introduced Asiatic apples with small, acid fruits suitable for preserves or pickles. All crabs are either shrubs or small trees belonging to the genus *Pyrus* (subgenus *Malus*) of the rose family (Rosaceae). Native American species are the narrow-leaved crab apple (*P. angustifolia*), with fragrant pink flowers and greenish-yellow sour fruits about 1 inch in diameter used for jelly, and its thorny variety *spinosa*; the highly ornamental and variable American crab apple (*P. coronaria*), with sweetly scented rose flowers and yellow-green sour fruits about 1½ inches in diameter; the western crab apple (*P. ioensis*), which crosses freely with other species, one of its commonest hybrids with apple being known as Soulard crab (x. *P. Soulardi*); and the Oregon crab apple (*P. fusca*), with white flowers, the only species found on the Pacific coast. Well-known introduced crabs are the Chinese apple (*P. prunifolia*) and the Siberian crab (*P. baccata*), with a small red or yellow fruit. Some of the many cultivated forms escape easily from cultivation. The common cultivated apple hybridizes readily with wild forms.

THEODOR JUST.

CRAB-EATING RACCOON. See RACCOON.

CRAB ISLAND, West Indies. See VIEQUES.

CRAB LOUSE, a sucking louse (*Phthirus pubis*), belonging to the family Phthiridae of the order Anoplura. It is closely related to the head and body lice which attack man. It gets its name from the fact that its feet end in a clawlike structure with which it grasps the hairs of the body so firmly that it is very difficult to dislodge. The crab louse is irregular in outline and only a little longer than wide. It is usually found in the pubic area and is often called the pubic louse. However, it is also found on hair of the chest, armpits, eyebrows, eyelids, and, rarely, upon the head. Crab lice are spread not only by personal contact but also through public toilets—infested individuals scratch them off onto the seats and they infest subsequent users. When numerous they produce a skin irritation called phthiriasis, a condition resulting from their bites. Their presence upon an individual is usually due to ignorance rather than lack of cleanliness. They are small and difficult to see. Until recently it has been difficult to control them, but now a single application of DDT, chlordan, or lindane powder eliminates them. If these are not available sulfur ointment may be used but two or three applications may be necessary.

CHARLES M. CURRAN.

CRAB SPIDER, a medium-sized spider belonging to several arachnid families, the best-known members belonging to the Thomisidae. They get their name from the fact that the anterior two pairs of legs are so modified that they resemble crabs. This adaptation enables them to move sideways with great speed and also provides them with the strength to hold their prey. The crab spiders are essentially hunting spiders. They build no webs and the only silk they spin is, that in which their eggs are en-

closed. Many kinds travel over the ground and bushes to ambush their prey, but species of *Misumena* and related genera conceal themselves in flower heads and capture insects seeking nectar or pollen. See also SPIDERS.

CHARLES M. CURRAN.

CRABB, kräb, George, English lawyer and philologist: b. Palgrave, England, Dec. 8, 1778; d. Hammersmith, Dec. 4, 1851. He studied in Germany and on his return to England published a German reader, grammar, and conversation book which were long in use. In 1829 he was admitted to the bar. His chief works are *Dictionary of English Synonymes* (1816) and *History of English Law* (1829). Among his other works are *Universal Historical Dictionary* (1825) and *New Pantheon or Mythology of All Nations* (1847).

CRABBE, kräb, George, English poet: b. Aldeburgh, Suffolk, England, Dec. 24, 1754; d. Trowbridge, Wiltshire, Feb. 3, 1832. He early showed a passion for reading. After a short time at school he became an assistant to an apothecary and, later, to a surgeon. He contributed verse to *Wheble's Magazine* in 1772. He continued his medical studies in London and returned to Aldeburgh to practice, but in 1780 abandoned medicine and went to London to pursue a literary career. The failure of his work *The Candidate* (1780) left him in financial straits and he appealed for aid to Edmund Burke, who became his patron and arranged for publication of *The Library* (1781). At Burke's suggestion he entered the Anglican ministry. He was chaplain to the duke of Rutland and held several other church livings, including the one at Trowbridge, which he held from 1814 until his death. His works, which were popular in his time, include *The Village* (1783), an object of Samuel Johnson's praise; *The Newspaper* (1785); *The Parish Register* (1807); *The Borough* (1810); *Tales in Verse* (1812); and *Tales of the Hall* (1819). Although he followed the classical convention and wrote mostly in heroic couplets, his works were admired by such Romantics as William Wordsworth, Sir Walter Scott, and Lord Byron. His reputation has declined, but he remains important for his unflinchingly realistic portrayals of the lives of the poor in old East Anglia. He is the subject of one of E. A. Robinson's most memorable poems, *The Children of the Night* (1897). Crabbe's *Works*, 8 vols., with a memoir by his son, first appeared in 1834. Sir Adolphus William Ward edited the *Complete Works*, 3 vols., which were published by the Cambridge University Press in 1905-1907. See PARISH REGISTER, THE.

Consult Ainger, Alfred, *Crabbe* (London 1903); Evans, John H., *The Poems of George Crabbe: a Literary and Historical Study* (New York 1933).

CRABETH, krä-bät', Dirck Pieters and **Wouter Pieters**, Dutch stained-glass painters of the 16th century: b. Gouda, Netherlands; d. there. Dirck's dates are usually given as 1501-1577; Wouter's, as 1509-c.1590. Both traveled in Italy, and Wouter especially was influenced by Raphael. Then each established a glass factory at Gouda. Wouter's paintings are found in France and Italy, but the best work of both brothers is in the Groote Kerk at Gouda, where they painted 13 windows. The nine windows

done by Dirck are more brilliantly colored than those done by Wouter. The finest of those done by Dirck are *Driving the Traders from the Temple*, *The Baptism by John*, and *The Last Supper*. The other windows include *Jonah and the Whale* (Dirck); and *The Queen of Sheba before Solomon*, *The Sacrifice by Elijah before the Priests of Baal*, and *The Sacrilege of Heliodorus* (Wouter). Wouter's work was of wider range than Dirck's, including some portraits and archer groups in the museum at Gouda, and surpassed his brother's in drawing and composition. Portraits of the brothers are in the Groote Kerk. Wouter's grandson, Wouter, was an historical painter.

CRABGRASS, a genus of annual and perennial grasses belonging to the millet tribe. The 50-odd species occur throughout the warmer regions of the world. The Latin name of the genus, *Digitaria*, is an allusion to the characteristic inflorescence, which consists of long, narrow, flower- and seed-bearing racemes radiating from the top of the stem in a digitate or finger-like manner. On account of the form of the inflorescence the plants are sometimes called finger grass. Most of the native North American species (that is, *Digitaria violascens*, *D. serotina*, *D. filiformis*, *D. villosa*, and *D. texana*) are good forage grasses. Some native European and Asiatic species introduced in North America, for example *Digitaria sanguinalis* and *D. ischaemum*, are troublesome weeds in cultivated fields and gardens.

CRABTREE, Lotta (originally CHARLOTTE), American actress: b. New York, N. Y., Nov. 7, 1847; d. Boston, Mass., Sept. 25, 1924. At the age of 10 she played the part of Gertrude in *The Loan of a Lover* at Petaluma, Calif. In 1864 she appeared in New York City in spectacular plays at Niblo's Garden, and first gained a reputation in John Brougham's *Little Nell and the Marchioness*. She soon became a favorite with the American public in pronounced comedy, playing parts especially written for her. Her chief successes were in *Topsy*, *Sam Willoughby*, *Firefly*, *Musette*, *Zip*, *Bob*, *The Little Detective*, and *Nitouche*. She retired from the stage in 1891, having acquired a fortune estimated at several millions of dollars, most of which she left to charity.

CRABTREE, William, English astronomer: b. Broughton, near Manchester, England, 1610; d. place and date unknown. Educated probably at the Manchester grammar school, he engaged in business as a clothier. He early became interested in astronomy, and was able to find defects in the calculations of Continental astronomers. In 1636 he started a correspondence with Jeremiah Horrocks (q.v.), and on Nov. 24, 1639, they were the first to observe the transit of Venus.

CRACKER AND BISCUIT INDUSTRY. Like most of the industries so closely integrated with our daily life it is impossible to establish an exact date for the beginning of the manufacture of biscuits and crackers. The industry includes the manufacture by machines of various crackers and cookies—hard and semihard sweet biscuits made by either cutting, rotary, embossed, bar or wire cut machines. Also included in the industry are the specialized bakers making

ice cream cones, sugar wafers, pretzels, and various toasts. The actual development of the industry as it exists today started with the invention of bakery machines in the middle of the 19th century. However, the development of the process goes back 6,000 years.

Archaeological archives reveal manuscripts and pictures of tools showing the early methods of baking. All baked products were at first in the style of hardtack, large flat sheets of dough made by mixing cracked grain with water. As the knowledge of baking increased new and better ways of grinding, mixing and baking the grain were discovered. The earliest actual record of biscuit manufacture was made by the Pharaohs of Egypt on their tombs: on the walls of a tomb of the 4th dynasty are pictures of shepherds kneading dough in a round stone dish. In the heap of ashes of the fire nearby appear six small cakes. This apparently is the most primitive method of early baking. During the reign of Rameses III a small bakery was established for the use of the royal family. At this time an oven designed like a large conical jar about three feet high and open at the top was used. The fire was prepared inside, flames issuing from the top, and the cakes were baked on the outside of the oven on a little narrow shelf near the top of the jar.

In Babylonia and Assyria baking was done only in the household. No particular trade was established, at least no record can be found of it in the Laws of Hammurabi. An early picture of an Assyrian army camp dated approximately 800 B.C. shows perhaps the earliest view of an oven where the baking was done on the inside and not on the outside, as was the case in Egypt.

In Greece nearly all baking was the work of slave labor, most of it done in bake shops where the Athenian bakers prided themselves on the production of fancy biscuits using wheat, barley or spelt. Early Greek manuscripts mention both unleavened and leavened biscuits as baked on the hearth or in the oven and described as fair-complexioned wheaten cakes.

The first leavening was of course not yeast but sour dough carried over from a previous baking. When used with fresh dough it would give the biscuit a larger volume and a slightly different flavor. The sweetening was honey. Eubulus mentions the twice-baked cake of Greece, undoubtedly something like zwieback.

In Rome, as in Greece, bakers belonged to the slave class. In the 2d century A.C. the Romans developed a large hand mill for grinding wheat. Up to this time all grain had been milled either by mortar and pestle or by rubbing between two stones. Public bakers were quite well known in Rome. At the time of Emperor Augustus, Eury-saces, a baker, had constructed a burial monument to himself using old kneading stones, and around the top appeared a frieze showing all the different processes used in the early bakery. In the excavation of Pompeii, buried by the eruption of Mount Vesuvius (79 A.D.), several public bakers were brought to light. Here we find the use of a fire under the oven, and presume that this type was most extensively used. Formulas of that period contained spices and were rich in cheese, butter, and eggs.

During the Dark Ages when nearly all progress stopped, the art of baking suffered a tremendous blow and throughout Europe we find evidence that bakeries had reverted to

the most primitive form. Out of this period of blackness there began to appear some semblance of order and, after the Norman Conquest of England (1060 A.D.) we find bakers guilds once more forming and carrying forth the advancement of baking. They spread rapidly throughout Italy, France, Germany, and Flanders during the 11th and 12th centuries. In the 13th century we find manuscripts showing that bakers have returned to using large brick ovens, and at the time of the Council of Constance in 1417 bakers were using portable ovens which they could move about the city making pastries and biscuits to order. However, resistance to progress developed in the guilds, leading to the organization of bake shops outside the guilds, and during the first half of the 17th century, as the new bakers began to turn out better work using labor saving devices the guilds lost their hold on the industry.

In 1670 we find the first evidence of mass production trends. There was a form of traveling oven, elongated in design, in which biscuits were placed in long troughs running through the oven; the baker slowly pushed his production along the troughs fast enough for them to bake, placing one cake behind the other, keeping a steady progress of goods traveling through.

Up to this point we find the advancement in the industry exceptionally slow. Milling of the grain was now done by millers entirely, and some bakers were beginning to specialize as the demand for biscuits increased about the middle of the 17th century due to the introduction into western Europe of three new nonalcoholic beverages—chocolate, coffee, and tea. Chocolate not only stimulated the consumption of and demand for light cakes and fancy biscuits but gave the cracker baker a new and very important material and flavor. Cheese and ginger cakes were very popular in the early coffee houses. The English national custom of afternoon tea, so evident in everyday English life, was popularized with the rise of the tea gardens, the most famous of which was perhaps Fox Hall which was started in 1660 and remained in existence under the name of Vauxhall until 1859.

From that time on we find an interest and improvement in bake shops, with a larger variety of ingredients finding their way into the market. Although the advance of the industry had been exceptionally slow, the popularity of biscuits was increasing and bakers began to employ more and more personnel. It must be realized, however, that conditions in England and in Europe were vastly different from those in the United States. Those great countries, being heavily populated, with labor cheap, had no interest in mechanical advancement. In the United States where labor was scarce and population scattered it was necessary to replace manpower with mechanical machinery. The actual development of labor saving machines in the baking industry does not date back much further than 1824, and during the next forty years there was a record of progress little short of miraculous. From 1824 until 1858 there were no less than twenty important developments patented for the industry. Machines for some time did not produce the same quality as did hand work, but as the machines were improved and production became more uniform, and many new designs for quality were developed, the industry broke into two separate classes, that of hand work and of machine work. During this period reel ovens, automatic cutting machines, machine dough

breaks, cooling conveyors, and mechanical mixers were developed.

At the beginning of the 19th century unsweetened and unleavened biscuits were found principally on shipboard where leavened bread could not be kept. For this reason pilot bread, commonly called "hardtack" was in demand in large quantities. When gold was discovered in California cross-country travel required three months and made it impossible to carry bulky food. Consequently every wagon-train made an effort to carry large supplies of biscuits. Then with the Civil War the consumption again vastly increased.

In 1824 Daniel Poole of Baltimore, Md., was granted a patent on a cracker machine. The word "cracker" is a common Teutonic word, in German *krachen* and in Dutch *kraken*, meaning to break with a sharp sound. Thus a cracker when properly baked follows its definition by making a cracking noise as it cools coming from the oven.

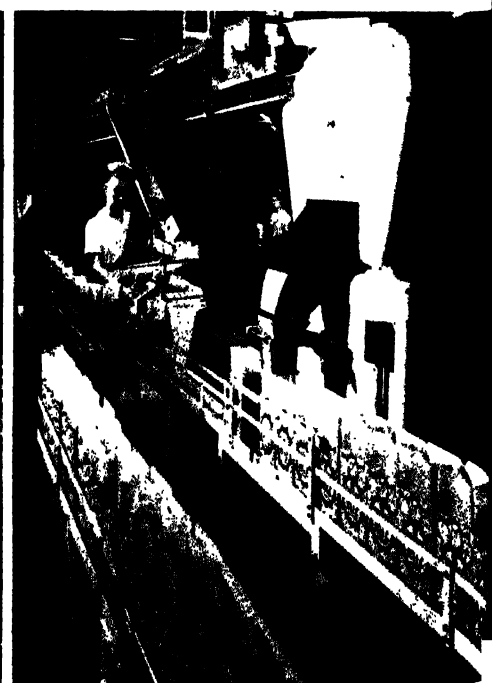
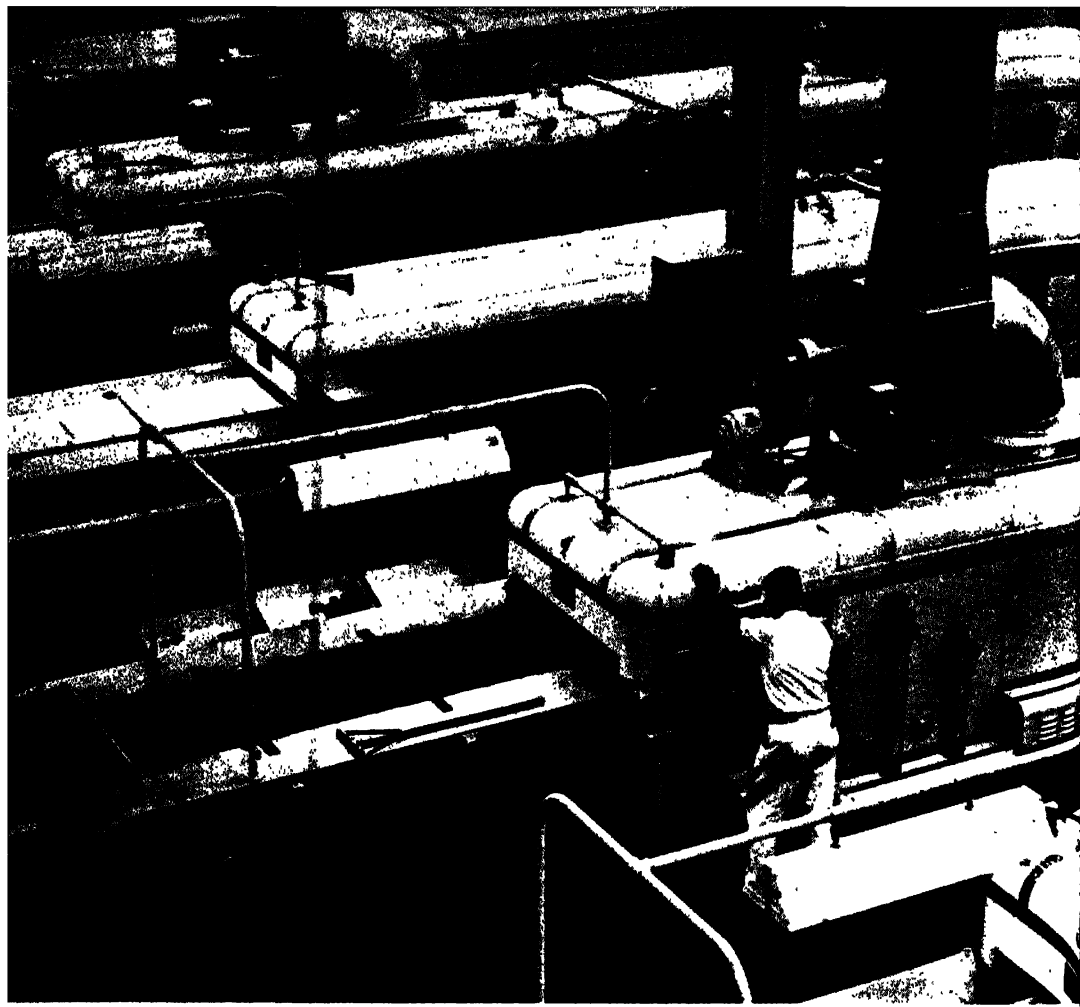
Who made the first soda cracker will probably never be known but fermented bread was in general use, and its lack of keeping qualities must have brought about a desire to roll the dough thin and bake it dry so as to make a bread that would keep a long time. Making holes in it to keep it from puffing was merely a mechanical operation and the rubberiness of the younger dough would naturally bring about experimentation leading to longer fermentation that would handle better in forming thin fermented biscuits. As travel became more extensive new varieties of biscuits were found in different parts of the world, and exchanges of formulas between bakers of different areas broadened the manufacturing possibilities and increased sales.

New machinery was introduced in later years such as the chocolate coating machines, the sandwich making machines, carton forming machines, marshmallow depositing machines, icing machines, topping machines, drying equipment, continuous running aprons on cutting machines, ball bearing peeling, panning and embossing machines, new ideas in cutters, new and better types of mixers, continuous marshmallow beaters and many things designed to convey finished goods and bring all plants as near as possible to mechanical perfection and as nearly automatic as possible.

The American biscuit and cracker industry actually started with Theodore Pearson at Newburyport, Mass., in 1792, manufacturing pilot bread, commonly called hardtack. Better known is the name of Josiah Bent who established his water cracker business in 1801, today known as Geo. H. Bent Company of Milton, Mass. Then Smith & Son, Inc., of White River Junction, Vt., started a business in 1815. Alfred Wyman in 1845 opened a cracker plant in Westminster, Mass., which still operates in the original building under the name of Dawley and Shepard. Between that time and 1950 hundreds of plants were started and many failed, while others prospered, and some merged to form such large companies as National Biscuit Company, Sunshine Biscuits, Inc., and United Biscuit Company.

Modern biscuit and cracker plants in 1950 included mixers capable of handling 1,500 pounds of dough at a time, ovens producing 9,000 pounds of finished biscuits per hour, and 300 feet in length. This same progress, so vividly illustrated in American industry, followed throughout Europe as local taxation increased and world commerce became so important. We find that each

CRACKER AND BISCUIT INDUSTRY: Top left: This mixed dough is being dumped to the floor below for baking. Top right: Using machinery of a type that is gradually being replaced by automatic devices, these operators are rolling dough to the proper thickness. Above: Crackers are cut out and stamped from a continuous sheet of rolled dough. Leftover dough, lower right, is returned to hopper and then rolled and stamped again.



National Biscuit Company

Top: Straight-line, mass-production baking. This battery of band ovens can bake 5,000,000 crackers in an eight-hour day
 Above left: Finished crackers leave the oven. Above right: Operator regulates flow of crackers through packaging machine

nation has contributed in some respects to the furtherance of the industry. American ingenuity developed many of the mechanical means; English dexterity developed new and improved production methods; national traits and tastes brought macaroons from Italy, sugar wafers from England, and rye-crisp from the Scandinavian countries. In the United States alone the industry grew from \$89,484,000 in 1914 to \$540,222,000 in 1947.

Modernization within the plants also brought many additional changes which have definitely affected the sales of biscuits and crackers, as well as their quality. Among the changes, which the consumer never sees, are the laboratories which conduct research on new materials, and control raw materials and processed goods. Sanitary departments are continually checking the plant and production facilities to insure the purity of the resultant product. Supervisory staffs are technically trained with a background suitable to the responsibility with which they are charged. Among the changes and perhaps the most important to the growth of the industry has been the improvement in packaging methods, keeping pace with the changes in distribution. The familiar cracker barrel of the general store has been replaced first by tins, later cartons, and finally caddies. National Biscuit Company pioneered in producing the first individually wrapped small package which swept the industry during the following years. Bulk sales, representing at first the entire production, in 1950 had declined to a very small percentage. In the large supermarkets the consumer may observe as many as 150 varieties of cookies and crackers on display, representing 6,000 years of advancement in the industry. The latest development in the packaging of biscuits and crackers is the 4-in-1 principle, according to which four individually cellophane wrapped packages are assembled in one carton, providing the housewife with a unit or units which she may open as desired, allowing the remaining packages to stay fresh for future use. The trend is toward providing the consumer with additional packaging protection so that each cookie and cracker, regardless of time and distance from the oven, will taste oven fresh.

The words biscuit, cracker, and cookie have been used by the industry to describe the type or classification into which a product falls. For instance the word biscuits is a term generally used to indicate any of the biscuit and cracker products. English biscuits specifies a type of sweetened product originating in England; under this heading we will find such items as Arrow-root, Nice, and Alberts. Nonsweetened and hard-crisp products such as Sodas and Grahams are referred to as crackers. Cookies are made from soft batters somewhat like cake batter and deposited on pans or on a band oven by means of a depositor.

E. J. VAN ALLSBURG,
Editor, "The Cracker Baker."

CRACKING PETROLEUM. The process in petroleum distillation known as cracking is the subjecting of certain distillation products to a degree of heat so far above their boiling points that they are decomposed into component parts whose boiling points are lower. It is accomplished in an ordinary fire still by condensing vapors arising from the boiling petroleum upon the cool dome of the still, whence they drop into

the superheated oil below, where they are broken up into lighter oils and instantly vaporized, passing over into the condenser. As ordinarily carried on, the process aims to increase the yield of illuminating oil (kerosine) by thus cracking the heavier oils, which distill over immediately after the kerosine vapors have ceased, that is, above the temperature of 625°F. When this temperature is reached the fire under the still is subdued, and the distillation continued slowly up to 700°, during which period the heavier oils dripping back are cracked into gasoline and kerosine. The additional amount of kerosine obtained from the oil is from 18 to 28 per cent. See also PETROLEUM.

The cracking process has more recently been invoked to secure a larger amount of gasoline from crude oil, and from kerosine, to meet the enormous demand for motor fuel. Several processes were invented, or at least patented, almost simultaneously. The Burton process in extensive operation in the United States keeps the entire contents of the still and also of the condenser under a pressure of 60 to 75 pounds to the square inch, through the manipulation of a valve, which is opened occasionally to avoid the liquefaction of the gases in the tubes. The sirupy residue of the distillation is distilled at atmospheric pressure, and its distillate returned to the cracking still. Some crude oils by this process are made to yield as much as 60 per cent in crude gasoline distillate. This is immediately available for use in marine motors, but requires deodorizing for use in automobiles.

The Hall process (American), patented in 1913, met with a warm reception in England and on the Continent, and many large plants are using it. The raw material in this process is common gas oil, and the gasoline yield reaches 70 per cent of "motor spirit," as it is called, having from 18 to 31 per cent more power than ordinary standard gasoline.

In the Rittman process the petroleum vapor is passed into a tube heated to 850°F., under very heavy pressures, ranging up to 500 pounds to the square inch. This vapor is then condensed under pressure, and the resulting liquid distilled for gasoline. The yield is from 60 to 70 per cent of the original bulk of the oil, in small quantities.

Other processes first subject the oil to great heat under heavy pressure, and then distill it; or take the vapors of boiling oil through iron tubes containing a red-hot sponge of some metal; or vary the operation either in the heat and pressure in the still, or in a decomposer, or by some other manipulation, the essential features being heat and pressure. All of these processes are successful to some degree in securing an increased yield of the sought-for gasoline.

Consult Foster, A. L., and others, *Petroleum Cracking and Refining* (Scranton, Pa., 1942); Kalichevsky, V. A., and Stagner, B. A., *The Chemical Refining of Petroleum*, rev. ed. (New York 1942); Bell, H. S., *American Petroleum Refining*, 3d ed. (New York 1945); Sachamen, A. N., *The Conversion of Petroleum*, 2d ed. (New York 1948); Nelson, W. L., *Petroleum Refinery Engineering*, 3d ed. (New York 1949).

CRACOW. See KRAKOW.

CRADDOCK, Charles Egbert, pseudonym.
See MURFREE, MARY NOAILLES.

CRADLE, krá'd'l, in its primary meaning, a baby's bed, usually equipped with rockers or

suspended in some way so the baby may be rocked. The name has also been extended to various kinds of framework suggesting a baby's cradle—the framework that keeps a boat or ship upright while on the ways; that which supports a rigid or semirigid airship during construction, or its car during inflation; the framework supporting a heavy gun; the framework used in building large rafts.

In engraving, a cradle (or rocker) is a sharp-toothed steel tool which is used with a rocking motion to raise burrs on the plate and so lay the ground in mezzotints.

In placer mining, a cradle (or rocker) is a box on rockers which contains a screen with small openings. Material from the deposit is placed on the screen and water is poured over it from a dipper while the cradle is rocked by hand. The water and small particles pass through the screen into the box, where the values (such as gold) are retained, while the water and waste material are discharged over the tailpiece. The cradle is invaluable for sampling placer deposits and may be used exclusively in small-scale placer mining.

In scything, a cradle is an attachment for the scythe, which is furnished with a set of long parallel fingers for catching the hay or grain being mowed and laying it in swaths.

CRADOCK, krăd'ŭk, **STR Christopher** (George Francis Maurice), British naval officer: b. Hartforth, Yorkshire, England, July 2, 1862; d. at sea off Coronel, Chile, Nov. 1, 1914. He entered the navy in 1875, served in the Sudan campaign of 1884, and during the Boxer Rebellion in 1900 distinguished himself at the storming of the Taku forts and participated in the relief of Tientsin. Thereafter he rose by normal stages to the rank of rear admiral (1910), becoming a Knight Commander of the Victorian Order in 1912. His *Whispers from the Fleet*, addressed chiefly to young naval officers, was published in 1907.

In February 1913, Cradock was given command of the North America and West Indies station, and on the outbreak of World War I had the responsibility of keeping the trade lanes free of German raiders. In September 1914, he undertook similar operations in the South Atlantic, at a time when Vice Admiral Maximilian von Spee, commander of the German Far Eastern Squadron, was known to be moving eastward across the Pacific with five cruisers superior in speed, armor, and gun power to Cradock's force of three cruisers, an armed merchantman, and an old, slow battleship.

Cradock's urgent request for reinforcements was refused by the Admiralty, which issued ambiguous orders that Cradock interpreted to mean he was to seek out von Spee and fight. He therefore rounded Cape Horn. New orders belatedly sent by the Admiralty, clarifying his instructions and informing him that reinforcements were being sent, never reached Cradock, who left the battleship behind to increase his squadron's speed in the search and engaged von Spee off Coronel, 15 miles south of Concepción, Chile. The Germans' superiority and von Spee's skillful use of it won them a quick victory, in which Cradock went down with his flagship, the *Good Hope*. Von Spee's squadron was destroyed in the Battle of the Falkland Islands in December. See also **WAR, EUROPEAN—Naval Operations**.

CRAFTS, kräfts, **James Mason**, American organic chemist: b. Boston, Mass., March 8, 1839; d. Ridgefield, Conn., June 20, 1917. He graduated from Lawrence Scientific School, Harvard, in 1858, and in 1860 went to Germany to continue his studies at the Bergakademie in Freiberg and at the University of Heidelberg, where for a year he was an assistant to Robert Wilhelm Bunsen. In 1861, Crafts moved to Paris to study under Charles Adolphe Wurtz and here he met Charles Friedel, with whom he later carried out some of his most brilliant researches.

Crafts returned to the United States in 1865 and after investigating mines in Mexico, 1866–1867, he became professor of chemistry at Cornell, 1868–1871, and then at the Massachusetts Institute of Technology, 1871–1874. Ill health forced his retirement from teaching and in 1874 he joined Friedel in Paris to devote himself to research, mainly in the field of organic chemistry.

Crafts made important contributions to thermometry and the determination of vapor densities, but his most fruitful achievement was his discovery with Friedel of the so-called Friedel-Crafts reaction, by which hundreds of new carbon compounds have been brought into existence.

In 1891, Crafts returned to the United States. He was professor of organic chemistry at the Massachusetts Institute of Technology from 1892 to 1897, and became president of the institute in 1898, resigning the presidency in 1900 to resume teaching and conduct research in thermometry and catalysis in concentrated solutions. Besides innumerable scientific papers, Crafts published *Qualitative Chemical Analysis* (1870), *Studies in Thermometry* (1880), *Catalysis in Concentrated Solutions* (1908), and *Thermometry* (1913–1915).

CRAG MARTIN or **ROCK SWALLOW**, a swallow (*Hirundo rupestris*) allied to the barn swallow. It is found from central Europe, the Mediterranean region, and northwestern Africa, eastward to China and Manchuria, the northern populations migrating to India and to Egypt and northeastern Africa in the winter. It frequents rocky cliffs along river banks and in mountainous areas, and builds a large open-topped nest of mud



Crag martin.

in niches of the rocks, or occasionally on the timbers of buildings or among ruins. The general color of the bird is ashy brown above, the lower parts creamy buff. The tail feathers are conspicuously spotted with white. A very similar species, the pale crag martin (*H. obsoleta*), occurs in some of the more arid parts of the range of the crag martin.

DEAN AMADON.

CRAIG

CRAIG, kräg, Charles Franklin, American bacteriologist and army officer: b. Danbury, Conn., July 4, 1872. He graduated from the Yale Medical College in 1894 and entered the army as an acting assistant surgeon in 1898. From that year until 1906 he served as a pathologist and bacteriologist in army hospitals in the United States, Havana, and Manila. He then became assistant professor of bacteriology and clinical diagnosis in the Army Medical School at Washington, 1909-1913, and from 1913 to 1918 he was the commanding officer of army laboratories at Fort Leavenworth, Kans., and El Paso, Texas. He was promoted to the rank of colonel in 1918.

Subsequently Craig served as professor and director of laboratories in the Army Medical School, 1920-1922; medical inspector of the Hawaiian Department, 1922-1926; and commandant and director of clinical pathology and preventive medicine at the Army Medical School, 1926-1930. He was professor of tropical medicine at Tulane University from 1931 to 1938.

Craig is known particularly for his studies of dengue and of *Plasmodium ovale* in malaria, and for his development of a new technique for the Wassermann test and a diagnostic test for amebiasis. Among his writings are *The Acute-Autumnal Malarial Fevers* (1901); *The Parasitic Amoebae of Man* (1911); *The Wassermann Test* (1918); *Amebiasis and Amebic Dysentery* (1935); *Clinical Parasitology*, with Ernest Carroll Faust (1937); *The Laboratory Diagnosis of Protozoan Diseases* (1941); and *The Etiology, Diagnosis and Treatment of Amebiasis* (1944).

CRAIG, Edward Gordon, English stage designer, actor, and producer: b. Harpenden, Hertfordshire, England, Jan. 16, 1872. The son of Ellen Terry and Edward William Godwin, he made his first stage appearances in London in 1878 and at Chicago in 1885, and his adult debut under Sir Henry Irving in London in 1889, with his mother in *The Dead Heart*. Craig continued with Irving, playing many Shakespearean roles, until 1897. He then left the stage to study drawing and wood engraving, publishing his woodcuts in *The Page* (1898-1901), but soon turned to stage design. From the start his work in this field assumed importance for the future of the theater.

He produced Henry Purcell's *Dido and Aeneas* in 1900 and George Frederick Handel's *Acis and Galatea* in 1902; followed in 1903 by Henrik Ibsen's *Vikings at Helgeland* (*Warriors at Helgoland*), with Ellen Terry in the lead, and Shakespeare's *Much Ado About Nothing*; a German version of Thomas Otway's *Venice Preserved* (Berlin 1904); designs for the production of *Electra* with Eleanor Duse in 1905; and Ibsen's *Rosmersholm* with Duse (Florence, Italy, 1906). Later productions included *Hamlet* for the Moscow Art Theatre in 1912 and a gala presentation of Ibsen's *Pretenders* at Copenhagen in 1926.

The keynote of Craig's designs is simplicity, a stage "cleared for acting," and the use of color and controlled light to create imaginative, symbolic, poetic effects. Like the achievement of Adolphe Appia (1862-1928) in Germany—above all in lighting—his work stands in sharp contrast to the cluttered sets of "photographically realistic" stage design. Not infrequently Craig's designs are difficult to adapt to existing theater architecture, however, and thus when seen in the theater are necessarily compromises.

Craig edited *The Mask*, a magazine devoted to theatrical masks, published from 1908 to 1929 in Florence, where he conducted his School for the Arts of the Theatre, founded in 1913. His publications include *The Art of the Theatre* (1905), *Towards a New Theatre* (1913), *The Theatre Advancing* (1921), *Scene* (1923), *Henry Irving* (1930), and *Ellen Terry and Her Secret Self* (1931).

Consult Rose, Enid, *Gordon Craig and the Theatre* (New York 1932).

CRAIG, James. See CRAIGAVON, 1ST Viscount.

CRAIG, Sir James Henry, British soldier and governor general of Canada: b. Gibraltar, 1748; d. London, England, Jan. 12, 1812. He entered the army in 1763 and in 1771 became captain of the 47th Regiment, which he accompanied to America in 1774 on the eve of the revolution. Craig was wounded at the Battle of Bunker Hill, and in 1776 with his regiment helped to repel the American invasion of Canada. The next year he distinguished himself in the early part of Gen. John Burgoyne's invasion of the Hudson River valley from Canada and was sent home with dispatches, thus escaping the fate of Burgoyne's army. In 1781 he fought under Gen. Charles Cornwallis in North Carolina and was promoted lieutenant colonel.

Craig took part in the disastrous expedition against the French in the Netherlands in 1794 as adjutant general to the duke of York's army. He was then given command of the troops sent from England with the fleet of Vice Admiral George Keith Elphinstone, which in cooperation with an army under Maj. Gen. Alured Clarke captured the Dutch colony at the Cape of Good Hope in 1795. Craig served as temporary governor of this colony until 1797, when he was made a Knight Commander of the Bath. Subsequently he held commands in India (to 1802) and England (to 1805), being promoted lieutenant general in 1801. On the outbreak of the War of the Third Coalition against Napoleon in 1805, Craig was sent to the Kingdom of Naples in command of 7,300 troops to join a Russian army of some 13,000 men under Gen. Maurice Lacy in a northward movement against the flank of Napoleon's army; but upon receiving news of Napoleon's shattering victory at Austerlitz, he abandoned the indefensible Italian mainland for Sicily, which was thenceforth a bastion of British strength in the Mediterranean. Ill health forced his return to England in 1806.

On Aug. 29, 1807, Craig was appointed governor general of Canada, a position for which he was ill-suited because of his temperament, lack of experience, and the precarious condition of his health. He reached Quebec on Oct. 18, 1807, and almost at once fell under the influence of the governing clique. Persuaded that French Canadian separatism implied disloyalty, he followed a repressive policy and undertook a long struggle with the Assembly of Lower Canada. This contest, in which his opponents were led by Jean Antoine Panet, speaker of the Assembly, and the bishop of Quebec, Joseph Octave Plessis, culminated in the arbitrary imprisonment of several members of the Assembly and the closing of the French Canadian journal *Le Canadien*. Pierre Bédard and others connected with *Le Canadien* were also imprisoned.

Craig resigned his office in October 1811 and returned to England, where he was promoted general in January 1812, shortly before his death. The conciliatory policy of his successor, Sir George Prevost, undid the damage of Craig's administration in time to unite Canadians against invasion by the United States during the War of 1812.

CRAIG, John, Scottish religious reformer: b. Aberdeenshire, Scotland, about 1512; d. Scotland, Dec. 12, 1600. He entered the Dominican Order some two years after completing his education at St. Andrews, but before long he was imprisoned on suspicion of heresy. Upon his release he went to England, in 1536, and from there to Rome, where through the influence of Reginald Cardinal Pole he was made master of novices in the Dominican monastery at Bologna, of which he later became rector. A chance reading of John Calvin's *Institutes of the Christian Religion* strengthened Craig's Protestant leanings. When this became known he was sent to the prison of the Inquisition at Rome. Condemned to the stake, he escaped—apparently when the mob broke open the prison on the death of Pope Paul IV in 1559—and ultimately reached Vienna, where he obtained the favor of the Archduke Maximilian (later the Emperor Maximilian II). Pope Pius IV sought his return as a heretic, but Maximilian provided for Craig's safe return to England in 1560.

Upon his return to Scotland, Craig became a preacher in the reformed church and in 1563 was appointed the colleague of John Knox in his church at Edinburgh. He is perhaps best known for his bold refusal, in 1567, to publish the banns for the marriage of James Hepburn, earl of Bothwell, to Mary, queen of Scots, after the murder of her previous husband, Lord Darnley—although Craig later complied under protest. During the years 1572 to 1579, he preached and taught at Montrose and Aberdeen, returning to Edinburgh in 1579 as chaplain to the young James VI. He took a leading part in church affairs, usually as a moderate following a middle course between the two extreme parties. Craig participated in the composition of the *Second Book of Discipline* and the National Covenant of 1580, and in 1581 wrote *Ane Shorte and Generale Confession of the True Christian Fayth and Religion, According to God's Worde and Actes of Our Parliamantes*, which was signed by the king and his household—hence called the King's Covenant—and became the basis of the National Covenant of 1638 and the Solemn League and Covenant of 1643, both of major importance in the religious history of Scotland.

CRAIG, Malin, United States army officer: b. St. Joseph, Mo., Aug. 5, 1875; d. Washington, D.C., July 25, 1945. He graduated from the United States Military Academy in 1898 and served in the Santiago (Cuba) campaign in that year during the war with Spain. Craig served in China in the Boxer Rebellion (1900), subsequently in the Philippines, and in France from 1917 to 1919. After World War I he was given commands in the United States, the Philippines, and the Panama Canal Zone, being promoted brigadier general in 1921 and major general in 1924. Craig served as army chief of staff with the rank of general from Oct. 2, 1935, to Aug. 31, 1939, when he retired. During World War II he was

recalled to duty as head of the Personnel Board of the War Department from 1941 to 1945.

CRAIG, Sir Thomas, Scottish jurist: b. Scotland, 1538?; d. there, Feb. 26, 1608. He was educated at St. Andrews and the University of Paris (1555–1561), and from 1564 to 1573 was justice depute (deputy) of Scotland, presiding over criminal trials. An adherent of James VI (James I of Great Britain from 1603), Craig was one of the Scottish commissioners appointed to confer on the projected union with England in 1604.

He was the author of many poems in Latin (including an epithalamium on the marriage of Mary, queen of Scots, and Lord Darnley in 1565) and of the following works, also written in Latin: *Ius Feudale*, his most important work published in 1603, demonstrating the common origin of Scottish and English feudal law; *Treatise on the Right of James VI to the Succession to the English Crown*; *Treatise on the Union* written about 1604; and *De Hominio*, a patriotic work written in 1605, contending that Scotland had never paid homage to English rulers except during the brief periods of English conquest.

CRAIG, William James, British Shakespearean editor: b. County Derry, Ireland, Nov. 6, 1843; d. London, England, Dec. 12, 1906. He was educated at Trinity College, Dublin, graduating M.A. in 1870. From 1874 to 1898 he was a tutor in London, except for the years 1876 to 1879, when he was professor of English language and literature at University College Aberystwyth, Wales. Craig edited the one volume *Oxford Shakespeare* (1894), and after 1898 he devoted himself to research and to editing *The Little Quarto Shakespeare* (40 vols. 1901–1904). He was general editor of the *Arden Shakespeare* from 1901 until his death.

CRAIGAVON, kräg-äv'un, 1st Viscount (JAMES CRAIG), a statesman of Northern Ireland: b. Sydenham, suburb of Belfast, Ireland Jan. 8, 1871; d. Glencairn, County Down, Northern Ireland, Nov. 24, 1940. He served with the British Army in South Africa in 1900–1902, and in 1906 was elected member of Parliament for East Down, Ulster. Craig held this seat until 1918, when he was elected member of Parliament for Mid-Down, 1918–1921. During this period Craig became Edward Carson's chief lieutenant in the Unionist agitation against the Home Rule Bill, which would have placed all Ireland, including Protestant Ulster, under a parliament at Dublin, thus breaking the ties with London.

While Carson led the Unionists in Parliament, Craig concentrated his efforts in Ulster, where a provisional government was made ready and the Ulster Volunteer Force was raised for armed resistance to a union with southern Ireland. The impending civil war was averted by the outbreak of World War I, and Craig served with the Ulster Volunteer Force (renamed the Ulster Division) in France, 1914–1915. Following the peaceful solution of the home rule question in 1920–1921, Craig resigned his seat at Westminster to enter the Parliament of Northern Ireland and become its first prime minister. He held this office from 1921 until his death, when he left the new state on a firm foundation. Craig was created a baronet in 1918, and Viscount Craigavon in 1927.

CRAIGIE, krä'gī, Pearl Mary Teresa (nee RICHARDS; pen name JOHN OLIVER HOBBS, höbz), English author: b. Chelsea, near Boston, Mass., Nov. 3, 1867; d. London, England, Aug. 13, 1906. She was born Pearl Richards, the daughter of a New York merchant who moved his family to London in 1868. London was thenceforth her home. In 1887 she married Reginald Walpole Craigie, but the marriage was unhappy and ended in divorce in 1895. She adopted the Christian names Mary Teresa on her conversion to Roman Catholicism in 1892.

Mrs. Craigie was a curious combination of religious mystic and worldly-wise member of fashionable London society. She began writing while still a girl and had her first considerable success with her first and second novels, *Some Emotions and a Moral* (1891) and *The Sinner's Comedy* (1892). These and her later works appeared under her pseudonym. Other novels, of which *The Herb Moon* (1896) is perhaps the best known, were comparative failures with the public. Between 1894 and 1904 she wrote several plays, of which *The Ambassador* (produced in 1898) and *The Bishop's Move*, written in collaboration with Murray Carson and produced in 1902, were well received. At its most successful, Mrs. Craigie's fictional work shows an acute observation of contemporary social life, sprinkled with epigrams; a glittering surface which does not always compensate for the slenderness of plot and characterization or the elusiveness of her ideas.

CRAIGIE, SIR William Alexander, Scottish philologist and lexicographer: b. Dundee, Scotland, Aug. 13, 1867. Educated at St. Andrews, 1883-1888, and at Oxford, 1889-1892, he studied Scandinavian languages in Copenhagen, 1892-1893, and returned to St. Andrews as lecturer, 1893-1897. In the last-named year he joined the staff working on the *Oxford English Dictionary*, of which he was joint editor from 1901 to 1933. Craigie was lecturer in Scandinavian languages at the Taylor Institution, Oxford, from 1905 to 1916, professor of Anglo-Saxon at Oxford, 1916-1925, and professor of English at the University of Chicago from 1925 to 1935. At Chicago he was coeditor, with James R. Hulbert, of *A Dictionary of American English on Historical Principles*, published in four volumes in 1938-1944. He was knighted in 1928.

Craigie was also the editor of *A Dictionary of the Older Scottish Tongue* (1931-) and edited a number of Scottish texts. Among his works on Scandinavian, Anglo-Saxon, and English subjects are: *The Religion of Ancient Scandinavia* (1906); *Skotlands Rimur* (1908); *The Icelandic Sagas* (1913); *Easy Readings in Anglo-Saxon* (1923); *Specimens of Anglo-Saxon Prose and Poetry* (1923-1931); *Easy Readings in Old Icelandic* (1924); *The Study of American English* (1927); *The Northern Element in English Literature* (1933); *The Art of Poetry in Iceland* (1937); *Specimens of Icelandic Rimur* (1952).

CRAIK, kräk, Dinah Maria (nee MULOCK and best known as Miss MULOCK, mü'lök), English author: b. near Stoke-upon-Trent, Staffordshire, England, April 20, 1826; d. near Bromley, Kent, Oct. 12, 1887. She was the daughter of a clergyman, who moved his family to London in 1839. She began as a writer of stories for children. Later works in this field, especially *The*

Fairy Book (1863), *The Adventures of a Brownie as Told to My Child* (1872), and *The Little Lamc Prince* (1874), were widely read, but her first success came with the appearance of her novel *The Ogilvies* in 1849. After writing several more novels, in 1856 she published her best known work, *John Halifax, Gentleman* (q.v.), which was followed by *A Life for a Life* (1859) and many others. She was also noted for her essays *Sermons out of Church* (1875) and *Plain Speaking* (1882), and wrote other poems, tales, and travel books. Her fiction is habitually optimistic in tone and frankly didactic. Modern readers are likely to find most of it kindly and pious but dull. Miss Mulock married the publisher George Lillie Craik in 1864.

CRAIK, James, American physician: b. Arbigland, near Dumfries, Scotland, 1730; d. Fairfax County, Va., Feb. 6, 1814. His father, William Craik, owner of the estate of Arbigland, had as gardener the father of John Paul Jones. The younger Craik studied medicine at the University of Edinburgh and in 1750 crossed the Atlantic, practicing in the West Indies and at Norfolk and Winchester in Virginia. On March 7, 1754, he was commissioned an army surgeon and in the next year he accompanied Gen. Edward Braddock's disastrous expedition against Fort Duquesne. When, later in 1755, Washington was appointed commander in chief of the Virginia forces, Craik became his chief medical officer.

A close friend of Washington, Craik played a prominent part in exposing the plot of the "Conway Cabal" to remove Washington from command during the American Revolution. In 1780 he organized hospitals for the comte de Rochambeau's army on its arrival at Newport, R. I. Craik was chief physician and surgeon of the army from 1781 to 1783, and physician general, 1798-1800, when there was a threat of war with France. He attended Washington in his last illness, concerning which he and Dr. Elisha Dick wrote a report. Washington bequeathed him a bureau and a chair from his study.

CRAIOVA, Krä-yö'vä (also spelled KRAJOVA), administrative region, Rumania, formed in 1952. The region, which is part of the great Rumanian grain and livestock district, lies in the southwest, between the Danube River in the south and the Transylvanian Alps in the north. The main centers, in addition to Craiova, the capital, are Turnu-Severin, near the Danube's Iron Gate, and the Danube River port of Calafat opposite Vidin, Bulgaria. Area about 6,000 square miles; pop. (1952 est.) 1,480,000.

CRAIOVA, Krä-yö'vä (also KRAJOVA), city, Rumania, on the Jiu (or Jiul) River, about 120 miles west-southwest of Bucharest. It became the capital of the Craiova Region under the Rumanian Constitution of 1952. Situated on the Bucharest-Budapest railway, in an upland region of grainland, pasture, and forest, Craiova is the commercial and industrial center of the district of southwest Rumania known as Oltenia or Little Walachia. The city is an important grain market and manufactures textiles, machinery, ceramics, cordage, leather goods, and foodstuffs.

Craiova, presumably founded on a Roman settlement, had become an important center of trade

the two most serious in New Jersey; bitter rot, fruit rot, and end rot are the three most serious in Massachusetts; and late rot is the most serious in Wisconsin and on the Pacific coast. Fermate, Karbam, and Karbam White have been found the most effective sprays in their control. Rose bloom is a fungus disease causing enlarged rose-colored shoots; it is controlled by spraying with bordeaux mixture. False blossom, the most serious of all diseases, is a virus disease producing a witches-broom development of the plant. It also stops fruit production. It is spread by the blunt-nosed leafhopper and is controlled by controlling the leafhopper with a 5 per cent DDT dust, a pyrethrum dust, or dusts containing rotenone.

Aside from the leafhopper, the root grub, fruitworm, fireworm, gypsy moth, and the girdler are the most serious insect pests. The root grubs are estimated to reduce the crop in Massachusetts alone by 150,000 barrels annually. Flooding until midsummer is considered the best control. The fruit worm may take one-third of the entire crop in some years; it is controlled by spraying or dusting in the blossoming period with derris or cryolite. Growers become expert in insect control.

Weed control is a major part of cranberry production. Many weeds, such as grasses, sedges, and rushes are controlled by spraying with water-white kerosene at 300 to 600 gal. per acre about the second week in May. Various other materials are used for other weeds.

Besides *O. macrocarpus* there are several other species of cranberries, none of which are cultivated. One, *V. vitis idaea*, is extensively harvested in northern Europe, northern Asia, and to a lesser extent in northern North America in the wild, and is used in commerce about as is the cranberry of this country. It is known by scores of common names. It is commonly called the European cranberry in this country, the "mountain cranberry" in New England, "foxberry" in Nova Scotia, "partridge berry" in Newfoundland, "cowberry" and "foxberry" in England, "tyttebaer" in Norway, Denmark, and Germany, "lingonberry" or "kroesa" berry in Sweden and Finland, and "preusselbeere" in Germany. It is represented in this country by a variety "minor," smaller in plant and fruit than the form found in Europe, which is shipped into this country from Canada. The European form is used much more commonly in the countries to which it is native than is the American cranberry in this country; and it is preserved by the housewives in great quantities. The berries ripen from August to October, are smaller than the American cranberry, and grow in clusters at the end of the shoot. They are gathered chiefly by hand but also with miniature scoops. They are sold on the fresh fruit market, and dried, are preserved, and the juice is packaged to be used in fruit soups. So far as known, it has not been crossed with the American cranberry.

The other species of cranberry are *O. quadripetalus* and *O. macrocarpus*. Both are commonly called "mossberries." They are circumpolar and are usually found growing on sphagnum moss. Though both are harvested for home use, they are rarely as abundant as the European cranberry and the cultivated species. *O. quadripetalus* is a tetraploid form in the United States while *O. macrocarpus*, the diploid form, is found in Alaska and British Columbia. Recently the chromosome number of the culti-

vated cranberry has been doubled by artificial means, and crosses have been made with the tetraploid *quadripetalus*.

The highbush cranberry, cranberry bush, or pembina is not a cranberry but a native American shrub, *Viburnum trilobum*, which commonly grows 6 to 12 feet high and bears clusters of very acid scarlet berries which are used for jelly. The European species, *V. opulus*, has bitter inedible berries.

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GEORGE M. DARROW,
Principal Horticulturist, United States Department of Agriculture.

CRANBROOK, Gathorne Gathorne-Hardy, 1st EARL, English statesman; b. Bradford, Oct. 1, 1814; d. Hemsted Park, Oct. 30, 1906. In 1865 he defeated Mr. Gladstone in the celebrated Oxford University election; in 1878 he was raised to the peerage as Viscount Cranbrook. He was under secretary of state for the Home Department (1858–1859), president of the Poor-law Board (1866–1867), home secretary (1867–1868), war secretary (1874–1878), secretary of state for India (1878–1880) and lord president of the council (1885, 1886–1892).

CRANBROOK, Canada, town of British Columbia, in the Kootenay Valley between the Selkirk and Rocky mountains, on the Canadian Pacific Railroad, 35 miles west of Fernie. It contains the provincial buildings, a high school, manual training school, several primary schools and churches. It has extensive agricultural and mining interests and is an important trade center. Its manufactures include brick yards, mineral water works, iron foundries, planing mills and sash and door factories. Pop. (1931) 3,067.

CRANCH, Christopher Pearse, American artist and poet; b. Alexandria, Va., March 8, 1813; d. Cambridge, Mass., Jan. 20, 1892. He was a son of William Cranch (q.v.). He studied at Columbian University, Washington, D.C.; was graduated at the Harvard Divinity School 1835; preached in Unitarian pulpits for a few years, and then gave himself up entirely to painting and poetry. He studied in Italy 1846–1848, 1853–1863, when he returned to America and was elected a member of the National Academy, but exhibited nothing after 1871. He was an intimate friend of Lowell and Longfellow; a man of versatile if not commanding talent; and one whose friendship was highly cherished by the few favored with it. Some of the best known of his paintings are *Val de Moline, Amalfi, Italy* (1869); *Venice* (1870); and *Venetian Fishing Boats* (1871). His well-known poem *Thought* appeared in *The Dial* (1840). His published works include *Poems* (1844); *Salan: a Libretto* (1874); *The Bird and the Bell, and Other Poems* (1875); *Ariel and Caliban* (1887).

CRANCH, William, American jurist; b. Weymouth, Mass., July 17, 1769; d. Washington, D.C., Sept. 1, 1855. He was graduated at Harvard in 1787; admitted to the bar in 1790; appointed an associate judge of the United States Circuit Court for the District of Columbia in 1801; and chief justice of that court in 1805.

CRANDALL, Prudence, American school-teacher: b. Hopkinton, R. I., Sept. 3, 1803; d. Elk Falls, Kans., Jan. 28, 1889. Of Quaker descent, she opened a school for girls at Canterbury, Conn., in 1831. She admitted a Negro pupil, whom she declined to dismiss despite the protests of the townspeople. The white pupils were then withdrawn from the school, and Miss Crandall decided to teach only Negroes. In 1833, as the new school was about to open, a town meeting was held to protest her action, and when this failed to dissuade her, her opponents influenced the state legislature to pass a law making it illegal to establish a school for Negroes not resident in the state unless the town in which the school was to be situated consented. Arrested and imprisoned under this law, Miss Crandall was brought to trial. Her case was espoused by noted abolitionists, who engaged counsel to defend her, and a newspaper, the *Unionist*, was founded in Brooklyn, Conn., to plead her cause. The jury disagreed, and a second trial was held, resulting in Miss Crandall's conviction. She appealed to the state supreme court, which reversed the judgment (1834). During the two years' struggle with the town, she had been subjected to threats and persecution, and she decided that it would be impossible to continue to operate a school there. Shortly thereafter, she married the Rev. Calvin Philleo and moved to Illinois. In 1874 she went to Kansas, where she spent the remainder of her life.

CRANE, (Robert) Bruce, American landscape painter: b. New York, N. Y., Oct. 17, 1857; d. Bronxville, N. Y., Oct. 29, 1937. He studied art in New York, where he was a pupil of Alexander H. Wyant, and in Paris, and held his first exhibition at the National Academy of Design in 1879. During his career he received numerous honors, including gold medals from the academy (1901 and 1912), the Webb Prize of the Society of American Artists (1897), and the bronze medal of the Carnegie Institute (1909), as well as medals at all the principal expositions. He became a member of the National Academy in 1902.

Among Crane's paintings are *March*, in the Brooklyn Museum; *Autumn Uplands*, in the Metropolitan Museum of Art; *Springtime*, in the Peabody Institute, Baltimore; *November Hills*, in the Carnegie Institute, Pittsburgh; *Autumn*, in the National Collection of Fine Arts, Washington; and *November Hillside*, in the Corcoran Gallery of Art, Washington.

CRANE, (Harold) Hart, American poet: b. Garrettsville, Ohio, July 21, 1899; d. at sea, April 27, 1932. Brought up mainly in Cleveland, he began writing verse at the age of 13. He traveled to Cuba and France; worked in a munitions plant and a shipyard in World War I, and later as a book clerk, reporter, and writer of advertising copy. Early in his twenties he moved to New York, where, with the aid of the banker-philanthropist Otto H. Kahn, he completed *The Bridge* (1930), a series of poems about the United States inspired by the Brooklyn Bridge. In 1930 he won the Helen Haire Levinson Prize awarded by *Poetry: A Magazine of Verse*, and in the following year was awarded a John Simon Guggenheim fellowship.

His brief career was marked by progressive personal disintegration until, while returning by

ship from Mexico to New York, he jumped or fell overboard. In his poetry, Crane has been accused of practicing the cult of unintelligibility, and as vehemently defended. He himself admitted that he was more interested in the psychological impingement of words on the consciousness than in their "rigid" logical meanings. Besides *The Bridge*, his books include *White Buildings* (1926) and *Collected Poems* (1933).

CRANE, Ichabod, the superstitious Yankee schoolmaster in Washington Irving's *Legend of Sleepy Hollow*, in *The Sketch Book* (1820), who was frightened away from the Hollow by his adventure with the Galloping Hessian, and so lost Katrina Van Tassel to his rival.

CRANE, Stephen, American writer: b. Newark, N. J., Nov. 1, 1871; d. Badenweiler, Germany, June 5, 1900. He attended Lafayette College and Syracuse University, but his mother's death in 1890 cut short his education. Moving to New York, he led a hand-to-mouth existence for five years as a free-lance writer for the *Tribune* and the *Herald*. He knew hunger and illness, and with the clear eyes of a reporter saw the life of derelicts in a great city. Out of this inner and outer turmoil came his first book, *Maggie: A Girl of the Streets* (issued by himself in 1892), which, though immature and a failure, was later to be called "the earliest of American realistic novels." The same extraordinary vividness and intensity characterized his masterpiece, *The Red Badge of Courage*, finished before he was 23 and published in 1895. Crane evoked the clamor and terror of death on the battlefield, creating an impressionistic picture of ordinary soldiers in the Civil War that perhaps no factual account could render. The book struck a new note in descriptive writing and made Crane famous, though it earned him little.

In 1896 he joined a filibustering expedition to Cuba. Out of his experiences when his ship was wrecked off the coast of Florida came his most famous short piece, *The Open Boat*, considered one of the finest stories in English. He was a war correspondent in Greece in 1897 and in Cuba, during the Spanish-American War, in 1898. His last year was spent in England, which he left just before his death from tuberculosis.

Besides other novels and two volumes of verse, *The Black Riders and Other Lines* (1895) and *War Is Kind* (1899), Crane wrote numerous sketches and short stories, some about children, others colorful tales of adventure in the West and Mexico. Much of his best-known writing is gathered in *Men, Women and Boats* (1921). *The Works of Stephen Crane*, in 12 volumes, edited by Wilson Follett, was published in 1925-1926. See also RED BADGE OF COURAGE, THE.

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CRANE, Thomas Frederick, American teacher and scholar: b. New York, N. Y., July 12, 1844; d. De Land, Fla., Dec. 9, 1927. He was educated at the College of New Jersey (now Princeton University), from which he received his B.A. degree in 1864, his M.A. in 1867, and his Ph.D. in 1883. After studying law, he was ad-

mitted to the New York bar in 1866, but practiced for only two years before he joined the faculty of the newly founded Cornell University as assistant professor of Spanish and German. He became a full professor in 1873, professor of Romance languages in 1882, dean of the college of arts in 1896, and dean of the university faculty in 1902, retiring as professor emeritus in 1909. In 1898-1899 and again in 1912-1913 he served as acting president of the university. Crane did pioneer research in folklore and medieval literature. His published works include *Mediaeval Sermon-Books and Stories* (1883); *Italian Popular Tales* (1885); an edition of *The Exempla, or Illustrative Stories from the Sermones Vulgares of Jacques de Vitry* (1890); *Mediaeval Sermon-Books and Stories and Their Study Since 1883* (1917); *Italian Social Customs of the 16th Century* (1920); and an edition of *Liber de Miraculis Sanctae Dei Genitricis Mariae, Published at Vienna, in 1731 by P. Pes* (1925).

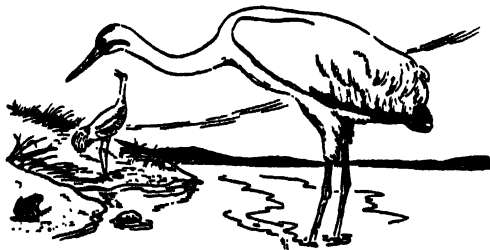
CRANE, Walter, English painter and illustrator: b. Liverpool, England, Aug. 15, 1845; d. Horsham, March 14, 1915. The son of Thomas Crane (1808-1859), portrait painter and miniaturist, he was apprenticed in 1859 to the wood engraver William James Linton (q.v.), in whose employ he became acquainted with the works of the Pre-Raphaelites. He soon began to illustrate books and paint pictures, and became associated with William Morris in the movement to reform British decorative art and in the advocacy of socialism. He served as president of the Arts and Crafts Exhibition Society (1888-1890; 1895-1915), director of design at the Manchester Municipal School of Art (1893-1896), and principal of the Royal College of Art (1898-1899). Among the books which he illustrated are *The New Forest* (1863); *The Baby's Opera* (1877); *Household Stories from Grimm* (1882), in which *The Goose Girl*, from which Morris wove a tapestry, appears; *The Sirens Three* (1886), a volume of his own poems; *Flora's Feast, a Masque of Flowers* (1888); *Queen Summer* (1891); *Renaissance* (1891); and *Spenser's Faerie Queene* (12 parts, 1894-1896), his masterpiece. He also wrote a number of books, including *The Bases of Design* (1898); *Line and Form* (1900); and *An Artist's Reminiscences* (1907). His pictures include *The Renaissance of Venus* (1877); *The Bridge of Life* (1884); *The Mower* (1891); and *Neptune* (1893).

CRANE, William Henry, American actor: b. Leicester, Mass., April 30, 1845; d. Los Angeles, Calif., March 7, 1928. He made his professional debut in 1863 with the Holman Opera and Dramatic Troup in Utica, N. Y., and remained with that company until 1870, when he joined the Oates Opera Company. At first a singer, he soon discovered that he had a natural talent for comedy. In 1874 he became a member of R. M. Hooley's stock company in Chicago, and three years later went to New York, where, with Stuart Robson, he enjoyed his first marked success in *Our Boarding House*. The two actors appeared together in a number of Shakespearean roles and, in 1889, in *The Henrietta* by Bronson Howard, their greatest success. Crane starred alone in *The Senator* (1889); *On Probation* (1890); *A Virginia Courtship* (1898); *David Harum* (1900-1903); in which he gave his most notable portrayal; *Business Is Business* (1906);

Father and the Boys (1907-1910); *The Senator Keeps House* (1911); and *The New Henrietta* (1914). After retiring from the legitimate stage in 1916, he played for a year in vaudeville, and later appeared in motion pictures.

CRANE, Winthrop Murray, American manufacturer: b. Dalton, Mass., April 23, 1853; d. there, Oct. 2, 1920. From 1870 he was employed by the Crane Company, his family's paper-manufacturing business, for which he secured the contract to supply paper for United States notes. He was a member of the Republican National Committee from 1892 to 1900 and from 1904 until his death. From 1897 to 1899 he served as lieutenant governor of Massachusetts, and from 1900 to 1902 as governor. In 1904, on the death of Senator George F. Hoar, he was appointed to the United States Senate, elected to fill the balance of the unexpired term, and re-elected in 1906, becoming one of its most influential members. Although ill health forced him to retire from public life in 1913, he retained an active interest in politics, and in 1919-1920 waged an unsuccessful fight for Republican approval of the League of Nations.

CRANE, the common name of the birds of the family Gruidae. Often confused with herons, to which they are not closely related, cranes are tall and graceful birds with long legs and a long neck. The plumage of some species is white with black wing quills, but others are brown and white, or gray; and the skin of the face, which is often devoid of feathers, is red. The beauty of some species, such as the crowned or Balearic crane and the demoiselle crane, is enhanced by ornamental plumes, which are displayed in curious courtship dances common to all cranes. Dante noted how the migratory European cranes (*Grus grus*), "chanting their dolorous notes, traverse the sky, stretched out in long array." The nearly extinct whooping crane (*G. americana*) of North



Whooping crane.

America was reduced, by 1954, to about 26 living individuals. This tallest of American birds has a wing spread of seven feet. A somewhat smaller species, the sandhill crane (*G. mexicanus*) lives in Cuba, Florida, and the Western states, ranging north to Alaska.

Cranes eat green shoots, seeds, snails, and insects which they find in marshes and open plains. They lay two eggs in a nest on a hummock in a marsh; the downy young are led away from the nest by their parents.

Consult Walkinshaw, Lawrence H., *The Sandhill Cranes* (Bloomfield Hills, Mich., 1950); Allen, Robert P., *The Whooping Crane* (New York 1952).

DEAN AMADON,
Associate Curator, Department of Birds, The
American Museum of Natural History.

CRANE, a hoisting machine so constructed as to move loads both vertically and in other directions. The use of cranes, in primitive form, can be traced back to antiquity. In modern times they have become universal, indispensable tools of industry and commerce. Cranes can be hand operated or driven by electric, steam, diesel, pneumatic, or hydraulic power. They can be (1) of the stationary type; (2) operated along overhead, side-wall, or ground rails limited to a plant area; or (3) mounted on a truck or caterpillar chassis or railroad car, for mobility. The variety of sizes and designs is extensive, consisting of adaptations of the crane's basic principles to a wide range of special uses.

Pillar Crane.—This type of crane consists of a column turning on a vertical axis, with an inclined boom which carries the load. Operating on ball or roller bearings, the boom is able to swing in a full circle, and the hoisting is done by means of a hand winch. The pillar crane is a light-duty type, usually designed for loads not exceeding 20 tons, with a working radius up to 20 feet.

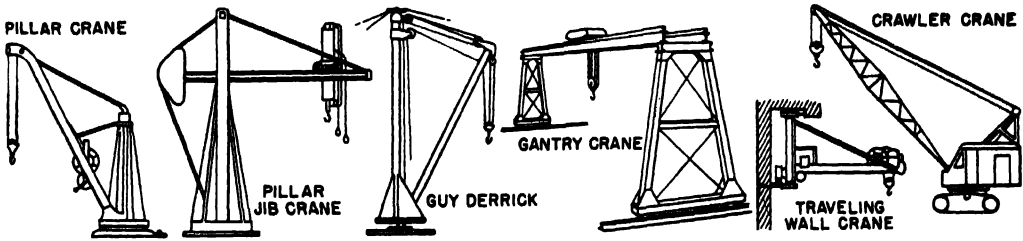
Pillar Jib Crane.—This type has a mast supporting a horizontal boom. The latter is usually an I-beam, with its lower flange serving as the track for the trolley which carries the hoist forward and back. As a rule, the trolley is op-

erated by hand; the hoist, by electric or pneumatic power.

the top of the mast to the ends of two sills, or timbers, set on the ground. These are bolted or weighted down, and each is secured at one end to the base of the mast. Jinniwink derricks use an A-frame instead of a mast, with an inclined strut resting on a T-shaped frame for its base. A tower derrick, used in building construction, has a square, guyed tower with a pivoted, counterweighted boom. The boom is shifted to progressively higher footings on the tower as the building goes up.

Traveling Bridge Cranes.—Overhead traveling bridge cranes operate on elevated parallel tracks, as far apart as the width of the plant area to be serviced. A bridgelike structure consisting of one or two main girders traverses the runway on wheels. A trolley carrying the hoisting equipment moves back and forth along the bridge, and a drum powered by an electric motor winds and unwinds the hoisting cable. Cranes of this type are usually controlled by an operator in a cab or cage attached to the underside of the bridge. They range in capacity from 2 to 400 tons, and in bridge span from 20 to 120 feet.

A gantry crane is a modification of the traveling bridge crane, for use out of doors where it is not convenient to erect an overhead runway. The bridge is mounted at each end on steel legs, which run along tracks at ground level.



erated by hand; the hoist, by electric or pneumatic power.

Other Jib Cranes.—Foundry cranes, machine-shop side-wall cranes, and yard derricks are varieties of jib cranes which require that the top of the column be secured to a ceiling or wall, or be braced by struts, guy ropes, or cables. Bracket jib cranes have a horizontal I-beam jib hinged to a wall bracket, and braced by an inclined rod that is hinged to a higher bracket. This type can be made portable, to serve different areas inside a plant, by means of socket and loose-pin connections. A walking crane is a jib crane designed for longitudinal traverse, moving along a floor track with a second rail on the wall supporting the top of the mast. A traveling wall crane requires three tracks: upper and lower rails to take the thrust, and a third track mounted on wall brackets to support the vertical loads.

Derricks.—Guy derricks, of wood or steel, are used in quarries, and in bridge and building construction. This type consists essentially of a mast, braced by guy ropes and pivoted at its base, with a hinged boom whose inclination is controlled by means of tackle connecting the top ends of the mast and boom. A double-drum winch, mounted at the base, operates the hoisting (up-and-down) and luffing (in-and-out) actions. Stiff-leg derricks are similar to guy derricks, except that, instead of using guy ropes, they are supported by two inclined struts running from

Crawler Cranes.—These consist of a lower frame (with caterpillar treads or heavy-duty wheels), and a rotating upper frame carrying the hinged boom, cables, power plant, and operating machinery. The boom can be raised and lowered to handle loads at different radii. Locomotive cranes are identical with crawlers, except that they are mounted on a base frame with four or eight wheels for traveling on standard-gauge tracks.

See also **HYDRAULIC CRANE**.

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CRANE FLY, any member of the dipterous family Tipulidae. Crane flies have long, slender legs which are weakly attached to the thorax and pull off easily. The larger ones are sometimes called daddy longlegs, and in some areas Jersey mosquitoes, although they do not bite. Their mouth parts are situated on a short or long snout. Crane flies are readily distinguished

from related families by the presence of a V-shaped depression on the top of the thorax. In size they range from one third of an inch to more than two inches. The larvae are elongate and have a distinct head and usually four anal appendages. The vast majority are aquatic or subaquatic and soft bodied, but some have a tough, brownish integument and are known as leatherjackets. These feed on the roots of plants and are sometimes serious pests of cultivated crops. More than 6,000 different kinds of crane flies have been described. See also DADDY LONGLEGS.

CRANE'S-BILL, wild geranium. See GERANIUM.

CRANFORD, township, New Jersey, situated in Union County, at an altitude of 75 feet, 5 miles west of Elizabeth, on the Rahway River, and on the Lehigh Valley Railroad (freight only) and the Central Railroad of New Jersey. Primarily a residential community, it is the seat of Union Junior College and has plants producing metal goods, heaters, baby products, and razor blades. The township was incorporated in 1871. Pop. (1950) 18,602.

CRANFORD. Not exactly a novel, Mrs. Elizabeth Gaskell's *Cranford* was first published as a series of 16 "sketches from life" in *Household Words*, a periodical which Charles Dickens was editing. When the series came to an end in 1853, the sketches were collected and issued as a book. Mrs. Gaskell wrote from memory upon Knutsford (renamed Cranford), a little country town in Cheshire, England, where she passed her childhood, where she later visited, and where she was married. And yet, though she drew freely from her recollections, her art required that she make many alterations in incident and character. Her Cranford is a town given over mostly to spinsters, who somehow manage to live in a genteel manner on small incomes inherited from a father or a mother dead long ago. A widow may be received into the society, but it is with some suspicion; and a retired army officer is welcome, provided he brings no wife. Rarely are there any marriages except among servants and shopkeepers. Mr. Hoggins, the doctor, manages to take Lady Glenmire, a newcomer, to the altar, but their conduct is frowned upon by the chaste ladies, one of whom, on retiring, always rolls a ball under her bed as a sure and easy means of detecting whether by chance a man lies concealed there to frighten her with "a great fierce face." The most exciting amusements are visits to the shops, little select parties at tea or at cards, and an occasional exhibition of a traveling juggler in the assembly rooms. A cow falls into a lime pit and loses all her hair, and her feminine owner dresses her in "a flannel waistcoat and flannel drawers" to keep away the winter's cold. The literary lady cultivates her mind with the works of Dr. Samuel Johnson, and contends that *Rasselas* far surpasses in humor anything in Mr. Dickens' *Pickwick*, then just appearing in monthly numbers. There are, of course, no children, but the younger members of the best society find something to do in chasing sunbeams from a new carpet in order that it may not fade. If Cranford has a central figure, it is Miss Matty Jenkyns, who should have married in youth Thomas Blundell, Esq., and been made happy

long ago. Both live into old age and die unmarried. Theirs is a romance of subdued but rare pathos.

Mrs. Gaskell wrote novels of wider sweep than *Cranford*. Her *Mary Barton*, for example, dealing with the conflict between labor and capital, between the manufacturer and the operatives in his mill, made a profound impression upon the Europe of her day. *Cranford* depicts a state of society which has very few resemblances to anything that may be seen in modern times; but it is a society upon which intrude none of man's darker passions—no greed or avarice or distrust or treachery. Over a woman's world as it once was, with its small duties, anxieties, fears, moderate pleasures, and respectable poverty, Mrs. Gaskell throws the glamour of her own delightful personality. Hers was a delicate humor, a true but not insistent pathos, and a charming style.

WILBUR L. CROSS,

Late Professor of English, Yale University.

CRANIAL INDEX. See CEPHALIC INDEX.

CRANIAL NERVES, the major paired nerves communicating with the central nervous system and passing into the skull. There are 12 pairs in man and the higher vertebrates and 10 pairs in fish and amphibia. An additional pair, the terminal (preoptic) nerve, occurs in all vertebrates but was not known when the numbering system was standardized. Beginning with the most anterior, the nerves are the first or olfactory, second or optic, third or oculomotor, fourth or trochlear, fifth or trigeminal, sixth or abducens, seventh or facial, eighth or auditory, ninth or glossopharyngeal, tenth or vagus, eleventh or accessory, and twelfth or hypoglossal.

Three pairs of cranial nerves supply the organs of special sense, nose, eye, and ear. The olfactory and optic nerves are composed of fibers originating in the sense organ and running to the brain as purely sensory nerves. At the optic chiasma, fibers of the optic nerve cross over to the opposite side of the brain. In forms with binocular vision approximately half of the fibers in each nerve cross over, and half are ipsilateral. The auditory nerve, concerned also with balance, is likewise a sensory nerve but possesses a ganglion along its course to the brain. Three pairs of cranial nerves (the third, fourth, and sixth) are distributed to the six muscles of the eye, and these nerves contain predominantly motor fibers. The fifth (trigeminal) nerve is one of the largest cranial nerves and bears a large ganglion (semilunar or Gasserian ganglion) near its origin. Beyond the ganglion the nerve divides into three main branches called the ophthalmic, maxillary, and mandibular nerves. The ophthalmic and maxillary nerves contain exclusively sensory fibers, while the mandibular nerve provides mixed sensory and motor elements for the lower jaw. Many of the sensations of pain in the facial area are referable to various branches of the fifth nerve.

The seventh or facial nerve arises from the medulla of the brain just anterior to the ear and bears a large (geniculate) ganglion. It supplies motor fibers to muscles of the face, neck, scalp, and ear, and also contains a sensory part as well as some fibers of the sympathetic nervous system. The sensory part includes the fibers from the taste buds of the anterior two thirds of the tongue. The facial nerve has branches com-

municating with fifth, eighth, ninth, and tenth cranial nerves. The eighth (auditory) nerve consists of two distinct branches: the cochlear (nerve of hearing) and the vestibular (nerve of equilibrium). The respective fibers arise in different structures in the internal ear and lead to different nuclei in the brain.

The ninth, tenth, and eleventh cranial nerves show a structural resemblance to the paired spinal nerves that is largely lacking in the cranial nerves anterior to the ear. These three nerves in the higher vertebrates have many communicating branches and are mixed motor and sensory nerves with sympathetic fibers. The ninth (glossopharyngeal) nerve is distributed primarily to the tongue and pharynx and includes taste fibers from the posterior part of the tongue. The eleventh (spinal accessory, accessory) nerve has two origins, cranial and spinal, some of the fibers of the latter arising as low as the fifth cervical nerve. The tenth (vagus, pneumogastric) nerve has the widest distribution of any of the cranial nerves. It courses through the neck, thorax, and abdomen. One branch supplies the heart with inhibitory fibers, and there are motor fibers to the esophagus, stomach, small intestine, and bile duct. This nerve is also distributed to the lung to form a pulmonary plexus. In the vertebrates with gills, each gill cleft receives fibers from the vagus, as does the swim bladder when it is present.

The twelfth (hypoglossal) nerve is a purely motor nerve primarily supplying the tongue. In lower vertebrates with 10 cranial nerves there are spino-occipital nerves which are probable homologues of the hypoglossal.

WILLIAM L. DOYLE,
*Professor of Anatomy, Department of Medicine,
University of Chicago.*

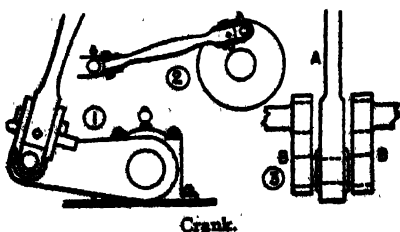
CRANIOTOMY. See OPERATIONS, SURGICAL—*Operations on the Nervous System.*

CRANIUM. See SKULL.

CRANK, in mechanics, is a fundamental form of the lever. The word, which is derived from the Anglo-Saxon *cranc*, meaning basically "to turn" or "to twist," signifies primarily a bend, the simple form of the crank consisting of the bent portion of an axle with which the axle is turned. In a windlass the crank is the crosspiece joining the axle and the handle. In a steam engine the crank may take the form shown in the accompanying diagram at 1, in which the broad end of the crank is keyed fast to a rotating shaft, and the smaller end is loosely bolted with a crank-pin to a connecting rod, to produce reciprocating motion.

Sometimes the crank takes the form of a wheel, as at 2, and is then termed a wheel crank. In the diagram the other end of the connecting rod is connected with a piston.

The double crank shown at 3 is employed



where the crank interrupts the axle lengthwise. In the diagram, *B* and *B* are the cranks, and *A* is the connecting rod. A three-throw crank consists of three of these double cranks on one axle. When there are two or more cranks on one axle, they are placed on opposite sides so as to balance. The one theoretical difficulty in the use of a single crank is that it has two dead centers in each revolution, the dead center being the point at which, if the motion is stopped, the parts are so aligned that neither a push nor a pull on the connecting rod will start rotation. With a three-throw crank the dead centers are timed so that one crank is always in working position.

A bell crank is a bent lever somewhat resembling an engine crank. It is used to change the direction of motion of a wire that pulls a mechanically operated bell.

The crank is the simplest device known for changing reciprocating (back-and-forth) motion into rotary motion, or vice versa, since it has few parts and nothing to get out of order, and the reciprocating part slows up and starts again with the most desirable speed ratio, obviating all shocks in the machine.

CRANMER, Thomas, English prelate and reformer: b. Aslacton, Nottinghamshire, England, July 2, 1489; d. Oxford, March 21, 1556. He was educated at Cambridge University, from which he received his B.A. degree in 1512 and his M.A. in 1515, and became a fellow of Jesus College. Ordained in 1523, he was appointed reader of a theological lecture at Jesus and public examiner of candidates for degrees in theology. In 1529, while he was staying at Waltham Abbey, he made the observation on the mediated divorce of King Henry VIII from Catherine of Aragon that the question of its propriety might better be decided by consulting learned divines and members of the universities than by an appeal to the pope. Cranmer suggested that if the queen's prior marriage to Prince Arthur were established, this would nullify her marriage to the king. His opinion gained the favor of Henry, who summoned Cranmer and ordered him to write a treatise on the subject. He was also made a king's chaplain. In 1530 he accompanied a mission to a meeting of the pope and Emperor Charles V at Bologna, and then went to Rome, where he had an interview with the pope. Two years later he was sent on a diplomatic mission to the emperor. While in Germany, he collected the opinions of various divines and canonists on the validity of Henry's marriage, and became acquainted with a number of reformers, including Andreas Osiander, whose niece he married.

Returning to England on his appointment as archbishop of Canterbury, he was consecrated at Westminster on March 30, 1533. Soon thereafter he declared the marriage of Henry and Catherine null and void, and confirmed the king's marriage with Anne Boleyn. He crowned Anne queen and served as godfather to the future Queen Elizabeth I. Archbishop Cranmer supported Henry's claim to supremacy over the Church of England, which was confirmed by Parliament in 1535 in the Act of Supremacy. In 1536 he annulled the king's marriage with Anne, and in 1537 he stood as godfather to the future King Edward VI. He attempted unsuccessfully to prevent passage of the Six Articles, abolishing diversity of opinion in theological matters. The revised English translation of the Bible, ordered in 1539 to be placed in

churches, received the name of *Cranmer's Bible*.

On the death of Henry, in 1547, the archbishop was named one of the executors of his will and a member of the regency appointed to govern the kingdom during the minority of Edward VI. He proceeded to model the Church of England according to the notions of Huldreich Zwingli, rather than those of Martin Luther. Under his direction the liturgy was drawn up and established by act of Parliament, and the prayer book and articles of religion (42 at first, later reduced to the famous Thirty-nine Articles) were compiled, the validity of which was enforced by royal authority and for which infallibility was claimed. The exclusion of Princess Mary from the crown by the will of Edward VI (d. 1553) was endorsed by Cranmer along with the partisans of Lady Jane Grey, apparently in opposition to his own judgment. With others who had been most active in her elevation, he was sent to the Tower on the accession of Mary. He was tried for treason, and being condemned, was sentenced to death but was spared by the queen, although he lost his position as archbishop of Canterbury. In March 1554 he was sent to Oxford with Nicholas Ridley and Hugh Latimer, and after being kept in prison for nearly a year and a half was formally tried. Cranmer's trial took place before a papal commissioner on the charges of blasphemy, perjury, incontinence, and heresy, and he was sentenced to be deprived of office and executed. After this, promises were made which induced him to sign a recantation of his alleged errors. He was placed on a scaffold in St. Mary's Church the day he was to suffer, there to listen to a declaration of his faults and heresies. Instead of confessing the justness of his sentence and submitting to it in silence or imploring mercy, he calmly acknowledged that the fear of death had made him belie his conscience, and declared that nothing could afford him consolation but the prospect of extenuating his guilt by encountering, as a Protestant penitent, with firmness and resignation, the fiery torments which awaited him. According to an eye witness report, after finishing his confession, he literally ran up the steps leading to the stake, with his guardians running after him. He was tied to the stake, the fire was lit and Cranmer, as he had promised, kept his right hand, with which he had signed his recantation, extended in the flames, that it might be consumed before the rest of his body, exclaiming from time to time, "This hand hath offended."

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CRANNOG, krăn'ög, a fortified lake dwelling. See LAKE DWELLINGS.

CRANSTON, krăn'stün, **Earl**, American Methodist bishop: b. Athens, Ohio, June 27, 1840; d. near New Richmond, Ohio, Aug. 18, 1932. He was graduated at Ohio University 1861 and served in the cavalry during the Civil War, rising to the rank of captain. He entered the Methodist Episcopal ministry (1867) and after serving numerous parishes, was publishing agent of the church from 1884 to 1896 when he was elected a bishop. During 1898-1900 he visited China, Japan, and Korea in discharge of his episcopal duties. He was commissioned by his church to unite all Methodist missions in Japan into one Japanese Methodist Church in 1907. He became resident bishop at Washington, D.C., in 1904 and retired in 1916 and devoted himself to the task of uniting the Methodist Church in America which had separated over the question of slavery.

CRANSTON, city, Rhode Island, in Providence County, altitude 60 feet, on the Pawtuxet River, served by the New York, New Haven and Hartford Railroad, four miles southwest of Providence. Surrounded by agricultural and industrial areas, its own industries are the manufacture of machinery, metal goods, plastics, rubber goods, chemicals, fire extinguishers, and textiles, especially print goods. It has several public libraries and is the seat of some state institutions, including a reformatory for boys and one for girls, a hospital, and a state prison. The villages of Arlington, Auburn, Meshanticut Park, and Pawtuxet are part of Cranston. Settled about 1638, incorporated as a township in 1754 and at that time named in honor of the colonial governor, Samuel Cranston, it became a city in 1910. It has a mayor and council type of government. Pop. (1950) 55,060.

CRANTARA, krăn-tä'rà (Gael. *crann*, wood or beam; *tair*, gathering) a half burned cross, dipped in blood, which was the rallying symbol in the Highlands of Scotland on any sudden emergency. It was dipped in blood to imply that any clansman failing to answer the call would suffer in kind. The Highlanders appear to have borrowed it from the ancient Scandinavians, of whose use of it Olaus Magnus, in his *Historia de Gentibus Septentrionalibus* (1555), gives a particular account. It was also called *crois-taraidh* or *croishtarich*.

CRANTOR, krăn'tör, Greek philosopher: b. Soli, Cilicia, c.335 B.C.; d. about 275 B.C. A pupil of Xenocrates at the Academy in Athens, he is best known for his commentary on Plato's *Timaeus*, the first commentary on Plato, and for his religious and philosophic work on grief.

CRAPPIE, kräp'i, a common name applied to two members of the freshwater sunfish group, the white crappie, *Pomoxis annularis*, and the black crappie, *Pomoxis nigromaculatus*. The white has six dorsal spines; the black, seven or eight. The length of the dorsal fin is relatively short in the white and long in the black. The greenish vertical bands of the white crappie are more conspicuous than those of the black.

Crappies range naturally from southern Canada through the Great Lakes area south to Florida and the Gulf of Mexico, and west to

CRASH — CRATAEGUS



Crappie

Nebraska, the white being more abundant in the southern parts of the range, and the black in the northern. Both species have been widely introduced into other waters.

CRASH, a coarse, heavy fabric, generally of linen, but sometimes of jute, cotton, or a mixture of fibers. It is used for toweling, table linen, suiting material, and draperies.

CRASHAW, krăsh'ô, Richard, English poet of the metaphysical school: b. London, England, ?1613; d. Loreto, Italy, Aug. 21, 1649. The son of William Crashaw (1572-1626), a Puritan poet and clergyman, he was educated at Charterhouse and at Pembroke Hall, Cambridge University, receiving his B.A. degree in 1634 and his M.A. in 1638. In 1634 he published anonymously a volume of 185 Latin epigrams, entitled *Epigrammatum Sacrorum Liber*. He became a fellow of Peterhouse in 1637, but lost his fellowship in 1643 because of his refusal to accept the Solemn League and Covenant. Three years later he went to Paris, where he became a convert to the Roman Catholic faith. Through the influence of his friend Abraham Cowley, he was introduced to Queen Henrietta Maria, who recommended him to Cardinal Palotta and others at Rome. In 1649 the cardinal made him a subcanon at Loreto. Crashaw's principal published work appeared in London in two parts in 1646. The first, entitled *Steps to the Temple*, is a collection of religious poems showing the influence of George Herbert. The second, called *The Delights of the Muses*, consists of secular poems. A second edition appeared in 1648; a third, bearing the title *Carmen Deo Nostro Te Decet Hymnus*, and including 12 engravings made from the poet's designs, was published in Paris in 1652. Crashaw also left many poems in manuscript.

CRASSULACEAE, krăs-û-lă'sê-ê, the orpine family, belonging to the order Rosales. Various circumscribed, the family includes several to more than 30 genera and from 500 to over 1,000 species of annual or perennial succulent herbs and shrubs and a few climbing members. It is widely distributed in dry regions, especially south central Asia, the Mediterranean area, South Africa, and Mexico, but few species are found in South America and practically none in Australia and Oceania. Well-known genera are stonecrop (*Sedum*), with about 350 species mostly of the temperate and northern boreal regions; houseleek (*Sempervivum*), with some 30 species of Eurasian distribution; the South African genus *Crassula*, with some 250 species; the African and Asian genus *Kalanchoe*, with 125 species; and the Mexican genus *Echeveria*, with some 80 species. Fanciers of succulent plants grow some 400 species belonging to about 20 genera as ornamentals.

THEODOR JUST.

CRASSUS, Lucius Licinius, Roman orator and politician: b. 140 B.C.; d. 91 B.C. In his early years a supporter of the Gracchi, he later became

more conservative in his views. In 95 B.C., he was elected consul together with Quintus Mucius Scaevola. During his term of office he proposed a law compelling all persons who were not citizens to leave Rome, a measure which proved a major cause of the Social War (q.v.). As censor in 92 B.C., he closed the schools of the rhetors on the ground that their influence on the minds of the young was bad. Crassus was a patron of the arts, and his mansion on the Palatine Hill was noted for its architecture, statuary, and paintings. The leading orator of his time, he was introduced as a speaker in *De Oratore*, as the representative of Cicero's own views on the subject of oratory.

CRASSUS, Marcus Licinius (surnamed Dives, meaning "the Rich"), Roman financier and politician: b. about 115 B.C.; d. Carrhae, Mesopotamia, June 6, 53 B.C. The younger son of Publius Licinius Crassus, who served as consul in 97 B.C. and committed suicide in 87 after being proscribed by the supporters of Gaius Marius, he fled to Spain after his father's death. When Lucius Cornelius Sulla returned to Italy in 83, Crassus joined him and rendered him important services, including a major contribution to Sulla's victory at the Colline Gate in 82. He was rewarded with donations of confiscated property and was permitted to purchase other confiscated estates at an almost nominal value. By these means and by subsequent real estate speculations he acquired a substantial fortune. As praetor in 71, he was in command against Spartacus and the revolted slaves. Spartacus and a large number of his followers were defeated and killed. In the following year, Crassus was elected consul with Pompey the Great, and in 65 he became censor. With Gaius Julius Caesar and Pompey, he formed in 60 the First Triumvirate, to which he gave substantial financial assistance. In 55 he again shared the consulship with Pompey, and the next year secured the proconsulship of Syria. Ambitious for military success, he undertook a campaign against the Parthians in 54, but after invading western Mesopotamia returned to Syria. In the following year he set out again, crossed the Euphrates River, and met the enemy near Carrhae (modern Haran). Badly defeated, he retreated to the town, where he was treacherously slain at a conference with the Parthian general.

His younger son, PUBLIUS LICINIUS CRASSUS (c.85-53 B.C.), served in Gaul under Caesar. He helped to defeat Ariovistus (58), conquered the coastal tribes (57), and defeated the Aquitanians (56). After returning to Rome in 55, he accompanied his father in the campaign against the Parthians, in which he lost his life.

CRATAEGUS, kră-tê'gûs, or **HAW-THORN** (also called **HAW** and **THORN**), a large genus of shrubs or small trees, 20 feet or more in height, found mostly in the temperate parts of Eurasia and the Americas south to the Andes, belonging to the rose family (Rosaceae). It is most abundant in the north-eastern and central United States, where more than 1,000 species have been described. For the Eastern states, however, it is more practical and scientifically sound to recognize about 100 species and some 60 local forms that may prove to be hybrids.

The leaves of *Crataegus* are alternate, simple,

and highly variable in shape and in type of margin (most are irregularly toothed), depending on whether they are vegetative leaves found on sterile shoots or ends of branches or floral leaves found on flowering branchlets or spurs. The perfect flowers, which resemble apple blossoms, appear in late spring or early summer. They are white or whitish, are grouped in showy clusters at the ends of twigs, and measure one-half to one inch across. Often they have a disagreeable odor. The fruit is a small reddish pome (like an apple) of varying flavor; it has a rather large, hard, separable center. The common names of the genus refer to the frequent presence of formidable thorns on the twigs, whereas the classical name is derived from the Greek word *kratos*, meaning strength, alluding to the hard, close-grained, reddish brown wood.

Hawthorn (*C. monogyna*) was introduced in early American gardens, whence it escaped and became established. *C. Oxyacantha*, with sharp thorns, is a frequently cultivated tree over 20 feet tall. A well-known indigenous species is the cockspur thorn (*C. crus-galli*), a tree growing to 20 feet or more and, with its many forms, very common in the Central and Eastern states.

Thorns are ubiquitous pasture weeds, often growing along fence rows or overrunning grazing lots, where cattle browse for young growths. The fruits are eaten by many birds, deer, gray foxes, and other animals. In addition to these uses, thorns are a source of honey, their wood may be used for turning, and they are planted for soil anchorage in eroded areas.

Any study of this genus is exceedingly difficult and requires careful collecting of the various types of leaves, flowers, and fruits, all of which should be taken from the same tree, preferably for a period of two successive years. The number of stamens and the color of the anthers and ripe fruit should also be recorded in the field.

THEODOR JUST,

Chicago Natural History Museum.

CRATCHIT, Bob, a character in *A Christmas Carol* by Charles Dickens. He is the father of Tiny Tim and the clerk of Ebenezer Scrooge.

CRATER, in astronomy, a southern constellation near the autumnal equinox. One of the constellations described by Ptolemy, it is located between Leo and Corvus. It contains 35 stars visible to the naked eye, the two largest being of the fourth magnitude.

CRATER, in geology, the opening on the tops or sides of volcanic mountains through which the lava and ashes are ejected. The crater of Mount Etna, like those of many of the most ancient volcanoes, does not retain the bowl-like shape to which the name owes its origin; that of Vesuvius, however, preserves the typical form. Variations in the form of the crater are due to the varying violence of the eruption. The more powerful eruptions tear off the top of the mountain and produce the hollowed cup. The craters of the Hawaiian volcanoes are usually large, Kilanea on Mauna Loa being about two miles in diameter and filled with a lake of molten rock. Such large craters are known as *calderas*. See also **VOLCANO**.

CRATER LAKE, in general a term applied to any lake occupying the crater of an extinct or

dormant volcano. In the United States the name is applied to a vividly blue lake in Crater Lake National Park (q.v.).

CRATER LAKE NATIONAL PARK, a 250.4-square-mile area located in Klamath County, southern Oregon, on the crest of the Cascade Range. It has as its central feature vividly blue Crater Lake, the deepest lake in North America and the fifth deepest lake in the world. This beautiful body of water lies in the heart of Mount Mazama, an ancient volcano whose destruction many years ago resulted in the formation of a vast crater in which water, derived from rainfall and snowfall, accumulated. The lake is 1,983 feet deep, 5 miles wide, and 6 miles long, and has a 20-mile shoreline from which rise multicolored lava cliffs 500 to 2,000 feet high.

Crater Lake has no inlet, and no outlet except by seepage. Evaporation, seepage, and precipitation are in a state of balance, and as a result the water level remains almost constant. The brilliant blue of the water is said to be caused chiefly by the scattering of sunlight in its clear depths, the blue rays of the sunlight being reflected from the water and the rays of other colors being absorbed. Rising above the surface of the lake are Wizard Island, a symmetrical cinder cone 780 feet high, and the Phantom Ship, 169 feet high, its shape suggesting a ship under full sail.

Excellent views of the lake may be had from observation points on the 35-mile drive which circles the rim of the crater. Trails lead from the drive to such high points on the rim as Mount Hillman, Garfield Peak, and the Watchman, as well as to Mount Scott (8,938 feet), highest point in the park, located back from the rim. The lake shore is accessible by trail. Launches and rowboats are available for scenic trips around the lake and for trout fishing.

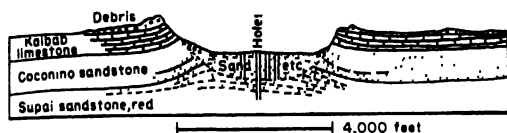
Crater Lake National Park has numerous trees, most of them cone bearers, and more than 570 species of flowering plants and ferns. Numerous small animals, such as golden-mantled ground squirrels, chipmunks, marmots, conies, and badgers, inhabit the park, and there are also some large species, such as bear and deer. More than 120 bird species have been noted, among them the golden eagle, southern bald eagle, falcon, and osprey.

Crater Lake was discovered on June 12, 1853, by John Wesley Hillman, a young prospector leading a party in search of the so-called Lost Cabin Mine. They named their discovery Deep Blue Lake. About a decade later, Chauncey Nye, leading a party of prospectors from eastern Oregon through the region, happened upon the lake. Thinking they had made a discovery, the prospectors named it Blue Lake. Yet another "discovery" was made in 1865 by two soldiers stationed at Fort Klamath, who called it Lake Mystery. In 1869 the lake was renamed Crater Lake by a group of visitors from Jacksonville, Oreg.

Crater Lake was little known until William Gladstone Steel visited it in 1885. Inspired by its beauty, Judge Steel conceived the idea of preserving it as a national park, an idea which he worked for assiduously until 1902, when Congress established the park, which now is administered by the National Park Service of the Department of the Interior. Following the establishment of the park, Judge Steel devoted his life to its development. He served as the second

superintendent of the park and later as park commissioner, an office he held at the time of his death in 1934.

CRATER MOUND or METEOR CRATER (formerly known as COON BUTTE), depression, Arizona, situated in Coconino County. This feature in the plains 20 miles west of Winslow is one of the most remarkable natural wonders in existence. It consists of a crater 600 feet deep and 4,000 feet in diameter surrounded by a rim 100 to 150 feet high. This rim consists of loose fragments of rock and sand from the hole. The walls of the hole are limestone (Kaibab) and sandstone (Coconino), more or less upbent and shattered. The relations are shown in the accompanying figure. The cause of this extraordinary hole is one of the perplexing questions over which scientists speculate. It has been suggested that the crater was caused by impact of a large meteor, a view sustained by the occurrence of



Section through Crater Mound, Arizona Plateau.

many small masses of meteoric iron in the vicinity, but a mining company organized to find and work the large mass of iron presumably buried in the hole obtained no evidence of its existence. A detailed survey with a magnetic needle hung to swing vertically also failed to indicate the presence of a body of metallic iron. A plausible suggestion is that the hole was caused by the explosion of volcanic steam accumulating in the porous sandstone under the dense limestone and finally reaching the limit of tension. Many conspicuous volcanic features occur in the general neighborhood but not in the immediate vicinity of the hole. Closely similar craters due to explosion are known in the Southwest, in Mexico, and in other parts of the world.

N. H. DARTON,

Late Director, United States Geological Survey.

CRATERS OF THE MOON NATIONAL MONUMENT, a 73.8-square-mile area located in Butte and Blaine counties, south central Idaho, established on May 2, 1924, to preserve a spectacular display of lava flows, cinder cones, and other volcanic phenomena. In its general appearance the area is suggestive of the surface of the moon as viewed through a telescope.

CRATERUS, krăt'ēr-ūs, Macedonian general: b. about 370 B.C.; d. Cappadocia, 321 B.C. One of Alexander the Great's most distinguished marshals, he fought in all the major battles in the East, from the Granicus (334 B.C.) to India (326). After the assassination of Parmenio in 330, he served virtually as second in command. Following the death of Alexander (323), Craterus was associated with his father-in-law, Antipater, as ruler of Macedonia and Greece. He was defeated and killed by Eumenes of Cardia.

CRATES, krăt'ēz, Greek comic poet: fl. about 450 B.C. His eminent success as an actor was repeated in his plays, which won praise from

Aristophanes and Aristotle. Crates was the first to concoct plots of a general character and to introduce intoxicated characters onto the comic stage. To him are ascribed 14 comedies, to 10 of which are assigned the 52 extant fragments of his work.

Consult Kock, Theodor, *Comicorum Atticorum Fragmenta*, vol. 1, pp. 130-44 (Leipzig 1880).

CRATES OF MALLUS, Greek grammarian: fl. about 160 B.C. He founded at Pergamum the grammatical school which, deriving its linguistic principles from Stoicism, espoused the system of anomaly in rivalry with the Alexandrian school of grammar under Aristarchus, who taught the system of analogy. (These systems treated mainly conjugational and declensional matters.) Crates probably supervised the composition of the Pergamene Library's catalogue. He introduced the formal study of literature into Rome, while on an embassy there about 159 B.C. His school had many eminent scholars and a long-lasting influence on Hellenistic theories of grammar.

While Crates commented critically and with antiquarian and allegorical interest on Greek poets such as Hesiod, Euripides, and Aristophanes, his chief commentary, which won much acclaim, was on the Homeric epics. Only a few fragments survive from these works and other treatises (agricultural, geographical, and scientific) ascribed to Crates of Pergamum, who may have been the grammarian.

Consult Sandys, J. E., *A History of Classical Scholarship*, 2d ed., vol. 1, pp. 156-60, 172 ff. (Cambridge, England, 1906).

CRATES OF THEBES, Greek Cynic philosopher: b. Thebes, about 365 B.C.; d. 285 B.C. Renouncing a large patrimony, which he bestowed on his native city, he migrated to Athens, where he imitated the self-control of his teacher, Diogenes, the notorious Cynic, but was more gracious in its practice than his master and became one of the most prominent professors of Cynicism. He taught Zeno, who founded Stoicism, and thus formed the link between the Cynics and the Stoics. Crates wrote many letters on philosophical problems and composed tragedies, all of which have been lost. Curious details of his career are given in Diogenes Laërtius' *Lives and Opinions of Eminent Philosophers* (book 6, chap. 5).

CRATINUS, krăt-i'nūs, Greek comic poet: b. about 484 B.C.; d. about 419 B.C. Although he began his dramatic career late in life, he lived to achieve much in his profession, exhibiting 21 comedies, of which 9 gained first prize (1 over Aristophanes) in the dramatic contests at Athens. Ancient authorities ranked him with Aristophanes and Eupolis as one of the greatest masters of Old Comedy. Cratinus found Greek comedy employed merely to excite merriment, but, while conserving its mirthful character, he converted it into a terrible weapon for chastisement of public and private vice and for satirical comment on prominent politicians. Thus he set the role peculiar to the poets of Old Comedy: severe censorship over contemporary politics and morals. Cratinus also developed that genre of comedy which burlesqued mythological characters. Whether he fixed the number of actors, which hitherto had been fluid, at three is uncertain, though he made some changes in comedy's external form. Vigor-

ous and direct in style, caustic in wit and satire, and ingenious in the invention of plots, he boldly changed the meaning of old words and cleverly coined new ones. His choruses were so admired that they were often sung at banquets. His dramas survive in 455 fragments, of which 182 are either too brief or too blind to allow assignment to his known plays.

Consult Kock, Theodor, *Comicorum Atticorum Fragmenta*, vol. 1, pp. 11-130 (Leipzig 1880).

CRATINUS, Greek comic poet: fl. about 350 B.C. An Athenian playwright of Middle Comedy, he sometimes is confused with his older and more celebrated namesake (c.484-c.419 B.C.). Consequently some scholars suppose that several of the comedies ascribed by ancient authorities to the elder Cratinus should be assigned to the younger. The 13 extant fragments apportioned among the nine plays attributed to him are too scanty to allow a confident appreciation of his style.

Consult Kock, Theodor, *Comicorum Atticorum Fragmenta*, vol. 2, pp. 289-93 (Leipzig 1884).

CRATIPPUS, krā-tīp'ūs, Greek historian: fl. about 390 B.C. Ancient authors report that he continued Thucydides' unfinished *History of the Peloponnesian War* by describing events in Hellas during 411-404 B.C., and then added a history of Hellas to 394 B.C. Only a few fragments of his work survive. There have been modern attempts to ascribe to him the authorship—which still awaits solution—of the *Hellenica Oxyrhynchia*, two groups of papyrological fragments (found in 1906 and 1934) giving a detailed history of Hellas for 396-395 B.C.

Consult Jacoby, Felix, "The Authorship of the *Hellenica* of Oxyrhynchus," *Classical Quarterly*, 44:1-11 (1950).

CRATIPPUS OF MYTILENE, Greek Peripatetic philosopher: b. Mytilene, ?75 B.C. He was held in the highest admiration by some of the principal Romans of his generation. Cicero, who called him the prince of all the philosophers whom he had heard and the peer of the most eminent Peripatetics, audited his lectures (51 B.C.) and sent his son to study under Cratippus in 44 B.C., when the latter was president of the Lyceum at Athens. After his defeat at Pharsalus (48 B.C.), Pompey received from Cratippus philosophical consolations on the lost cause of republicanism. Caesar conferred on the philosopher the prized possession of Roman citizenship (c.46 B.C.). Brutus attended his classes, while he prepared at Athens (44-43 B.C.) to resist Octavian and Antony. The only known treatise (now lost) of Cratippus treated divination, of which he eschewed all kinds except those induced by dreams and by frenzy.

CRAU, krō, plain, France, situated in Bouches-du-Rhône Department, west of the delta of the Rhone River and south of the Alpines. Covering an area of approximately 80 square miles, it consists partly of marshy lowlands and partly of stony wasteland. By means of irrigation canals from the Durance River grapes and olives are raised in some sections of the Crau, and sheep are raised elsewhere.

CRAUE, krōk, Gustave Adolph Désiré, French sculptor: b. Valenciennes, France, July

16, 1827; d. Paris, Nov. 17, 1905. A student of James Pradier, he won the Prix de Rome in 1851. Among his notable works are monuments to Admiral Gaspard de Coligny (Rue de Rivoli, Paris) and Charles Martial Cardinal Allemand-Lavignerie (Carthage); *La victoire couronnant le drapeau français* (Place des Arts et Métiers, Paris); *Le Crépuscule* (Avenue de l'Observatoire, Paris); a statue of Gen. Antoine Eugène Alfred Chanzy (Le Mans); and busts of Marshals Adolphe Niel and Patrice de MacMahon and of Empress Eugénie. There is a museum dedicated to Crauk in Valenciennes.

CRAVEN, Avery Odelle, American historian: b. Randolph County, N. C., Aug. 12, 1886. He was educated at Simpson College (B.A., 1908), Harvard University (M.A., 1914), and the University of Chicago (Ph.D., 1923). After teaching at the College of Emporia (1920-1922), Michigan State College (1923-1924), and the University of Illinois (1924-1928), he became associate professor and then (1929) professor of American history at the University of Chicago. His published works, dealing mainly with phases of Southern history and with the Civil War (which he maintains could have been avoided), include *Soil Exhaustion as a Factor in the Agricultural History of Virginia and Maryland, 1606-1860* (1926); *Edmund Ruffin, Southerner: A Study in Secession* (1932); *The Repressible Conflict, 1830-1861* (1939); *Democracy in American Life: A Historical View* (1941); *The Coming of the Civil War* (1942); *The United States, Experiment in Democracy* (with Walter Johnson, 1947); and *The Growth of Southern Nationalism, 1848-1861* (1953).

CRAVEN, Pauline, French author: b. London, England, April 12, 1808; d. Paris, France, April 1, 1891. The daughter of a diplomat, Comte Auguste Marie de la Ferronays, who served briefly as foreign minister during the reign of Charles X, she married in 1834 a British diplomat, Augustus Craven (d. 1884), grandson of the margravine of Anspach. She traveled extensively and spent much time in England and Italy. Her most celebrated work, *Récit d'une soeur, souvenirs de famille* (1866), which was crowned by the French Academy, tells the story of the vicissitudes of her own noble Roman Catholic family. Her first novel, *Ann Séverine* (1868), was followed by *Fleurange* (1869); *Le mot de l'énigme* (1874); and *Le Valbriant* (1886). Among her other published works are *La marquise de Mun* (1877); *Réminiscences: Souvenirs d'Italie et d'Angleterre* (1879); *La jeunesse de Fanny Kemble* (1880); and *Lady Georgiana Fullerton, sa vie et ses oeuvres* (1888).

CRAVEN, Thomas Tingey, American naval officer: b. Washington, D.C., Dec. 20, 1808; d. Boston, Mass., Aug. 23, 1887. The brother of Tunis Augustus Macdonough Craven (q.v.), he joined the United States Navy as a midshipman in 1822, and became a lieutenant in 1830. In 1838-1839 he served as first lieutenant of the *Vincennes*, the flagship of Lieut. Charles Wilkes' exploring expedition in Antarctic waters. He aided Commodore Matthew C. Perry in suppressing the slave trade off the African coast in 1843-1844, and in 1852 was promoted to the rank of commander. From 1850 to 1855 and again from 1858 to 1860 he was commandant of midshipmen

at the United States Naval Academy. He became a captain in 1861, and in the following year, while in command of the *Brooklyn* of Admiral David G. Farragut's squadron, assisted in the capture of New Orleans. While in command of the *Niagara* in 1863, he was promoted to the rank of commodore and ordered to European waters. He captured the *Georgia*, a Confederate steamship, off Portugal in 1864, but in the following year, outmatched by the Confederate ironclad *Stonewall*, refused its challenge. This action resulted in a court martial sentence of two years' suspension, which was set aside by Secretary of the Navy Gideon Welles. Promoted to the rank of rear admiral in 1866, he retired from the navy three years later.

His son ALFRED CRAVEN (b. Bound Brook, N. J., Sept. 16, 1846; d. Pleasantville, N. J., Sept. 30, 1926) was a civil engineer. A graduate of the United States Naval Academy (1867), he was a surveyor and mining engineer in California and Nevada from 1871 to 1884, when he moved to New York City. He was an engineer on the Croton Aqueduct (1884-1895); in charge of construction of the Jerome Park Reservoir (1895-1900); in charge of construction of the Broadway subway from 42d Street to 104th Street (1900-1905); deputy chief engineer of the Rapid Transit Commission (1905-1907); deputy engineer of subway construction for the Public Service Commission (1907-1910); and acting chief engineer and later chief engineer in charge of construction of the dual system of subways (1910-1916). After retiring in 1916 he served as a consultant to the Public Service Commission and its successor, the Transit Construction Commission, until 1920.

CRAVEN, Tunis Augustus Macdonough, American naval officer: b. Portsmouth, N. H., Jan. 11, 1813; d. Mobile Bay, Ala., Aug. 5, 1864. The youngest brother of Thomas Tingey Craven (q.v.), he joined the United States Navy as a midshipman in 1829 and became a passed midshipman in 1835. In that year he was first assigned to coastal surveying, a field in which he specialized during most of his naval service. He became a lieutenant in 1841 and a commander in 1861. He was chief editor of the *United States Nautical Magazine* (1845-1846); served in the Pacific Squadron (1846-1849); and was in charge of surveying a canal route through the Isthmus of Panama (1857-1858). While in command of the *Mohawk* (1859-1861), he captured a slave ship off the coast of Cuba. After the outbreak of the Civil War he was instrumental in preventing the Confederate capture of Key West. He served in European waters from 1861 to 1863, when he was given command of the ironclad *Tecumseh*. After serving in the James River, he was ordered to join Admiral David G. Farragut off Mobile, where he arrived on Aug. 4, 1864. In the ensuing Battle of Mobile Bay, the *Tecumseh* fired the first shot. Less than an hour later the ship struck a mine and sank, and Craven and almost all the members of the crew lost their lives.

CRAVEN, William, EARL OF CRAVEN, English Royalist: b. 1606; d. April 9, 1697. The eldest son of Sir William Craven (1548?-1618), who was lord mayor of London in 1610-1611, he attended Trinity College, Oxford, and entered the service of Maurice of Nassau, prince of

Orange, and his successor, Frederick Henry. Returning to England in 1627, he was knighted and created Baron Craven of Hampsted Marshall. In 1631 he became a commander of English troops under Gustavus Adolphus in Germany. In the following year he made a fruitless attempt to recover the Palatinate for Elector Frederick V and his consort, Elizabeth of Bohemia, daughter of James I of England. A similar effort on behalf of their son, Charles Louis, in 1637 was also unsuccessful, and Craven was taken prisoner. Ransomed two years later, he returned to England and gave considerable financial assistance to Charles I during the civil war. Subsequently he became a member of Elizabeth of Bohemia's court in the Netherlands and extended aid to her and to the exiled Charles II. His estates in England were confiscated by Parliament in 1651, but he recovered his fortune after the Restoration, when his loyalty was rewarded with numerous honors. In 1664 he was created Viscount Craven of Uffington and earl of Craven. He served as privy councilor (1666 and 1681), lieutenant general (from 1667), and lord lieutenant of Middlesex and Southwark (1670-1689). At James II's accession in 1685 he again became a member of the Privy Council and was made lieutenant general of the forces.

CRAWFISH. See CRAYFISH.

CRAWFORD, Francis Marion, American novelist: b. Bagni di Lucca, Italy, Aug. 2, 1854; d. Sorrento, Italy, April 9, 1909. Brought up mainly in Italy, where his American father, Thomas Crawford (q.v.), had long resided as a sculptor of some note, young Crawford received an amazingly varied and cosmopolitan education. He was early fluent in several languages—English, Italian, and French (the language of his governess), and soon was to know most European languages, including Russian and Turkish, and many Oriental tongues. At 12 he went to the United States and spent two years at St. Paul's School, Concord, N. H., then entered Harvard for a short period. He spent four years (1870-1874) in England, mainly at Trinity College, Cambridge, where he studied Spanish, German, and Swedish, followed by two years at Karlsruhe and Heidelberg, Germany, and a similar period at the University of Rome, where he specialized in Sanskrit.

His father had died, and the consequences of the panic of 1873 had greatly depleted his mother's fortune. In 1879, Francis went to India and, turning to journalism for a living, edited the *Indian Herald* at Allahabad for a year and a half, meanwhile continuing his studies of Eastern languages and philosophy. In 1881 he again went to the United States, living in New York and Boston; while writing for various periodicals, he studied Sanskrit and Zend at Harvard. In Boston he made his home with his maternal aunt, Julia Ward Howe, author of *The Battle Hymn of the Republic*.

The turning point in the young man's career came when he told his uncle, Samuel Ward, a story about the adventures of a diamond merchant in India. Urged to set it down on paper, Crawford, then 28, wrote his first novel, *Mr. Isaacs*, in less than six weeks. The book (1882) was a sensation; he had found a well of fiction in himself. With his abounding energy and his background of travel in romantic places, he poured

forth a stream of historical romances, sometimes finishing one in a single month, often publishing 2 or 3 in a single year. His books were immensely popular. In 25 years he produced more than 40 novels, besides serious historical and critical works of philosophy, philology, and archaeology. His only play, *Francesca da Rimini*, was produced by Sarah Bernhardt in Paris in 1902.

Naturally much of the high-speed output of F. Marion Crawford, as he signed himself, was ephemeral and of little artistic merit. But his Italian series, depicting the life of a noble Roman family in the picturesque setting he knew and loved so well, has held the respect of literary critics. These novels beginning with *Saracinesca* (1887) and including *Sant' Ilario* (1889), *Don Orsino* (q.v., 1892), and *Corleone* (1896) have been lauded as works of high dramatic and aesthetic quality, "hardly equalled in their kind by the romances of any other American writer." *A Cigarette Maker's Romance* (1890) has also won praise as displaying his technique at its soundest and most characteristic. Among his novels with an American locale, generally depicting aspects of New York life, *The Three Fates* (1892) is rated highest. His scholarly side as historian and archaeologist is found in the group of which *Ave Roma Immortalis* (1898) is most conspicuous. His two novels written in both English and French—*Zoroaster* (1885) and *Marsio's Crucifix* (1887)—won him a French Academy prize.

Crawford viewed the novel as "a pocket theater," and his own writing was frankly designed for entertainment (see his *The Novel—What It Is*, 1893). He had the authentic gift of the born storyteller, he was a master of plot and of dialogue, and he excelled in creating vivid characterizations and scenic pictures. Though he settled at Sorrento in 1885 in a villa overlooking the Mediterranean, Crawford was a great traveler; he made numerous trips to the United States and, as captain of his own yacht, to out-of-the-way spots in many parts of the world.

CRAWFORD, George Walker, American lawyer and public official: b. Columbia County, Ga., Dec. 22, 1798; d. July 22, 1872. Graduated from the College of New Jersey (now Princeton University) in 1820 and admitted to the bar in 1822, he opened a law office in Augusta, Ga., and served as attorney general of Georgia from 1827 to 1831. He was a member of the state legislature from 1837 to 1842, except for one year, and a Whig representative in Congress in 1843. In that year he was elected governor of Georgia and, re-elected in 1845, served until 1847. He was appointed secretary of war by President Zachary Taylor in 1849, but resigned after the president's death (1850) and retired from public life. In 1861, however, he served as chairman of the state's secession convention.

CRAWFORD, Isabella Valancy, Canadian poet: b. Dublin, Ireland, Dec. 25, 1850; d. Toronto, Ontario, Canada, Feb. 12, 1887. With her parents she emigrated to Canada in 1858 and lived in the Kawartha Lakes region, where her father practiced medicine. After his death she and her mother moved to Toronto, where she published poetry and short stories in newspapers. Her only book, *On the Spookiest Pass, Malcolm's Katie, and Other Poems*, appeared in 1884. Her poetry,

lyrical and rich in imagery, was inspired by the Ontario villages where she grew up. Her *Collected Works*, edited by J. W. Garvin, were published in 1905.

CRAWFORD, Thomas, American sculptor: b. New York, N. Y., March 22, 1813?; d. London, England, Oct. 10, 1857. Apprenticed at the age of 14 to a woodcarver, he later worked with the tombstone cutters Frazee & Launitz, and studied anatomy at the National Academy of Design. In 1835 he went to Rome carrying letters of introduction to Bertel Thorvaldsen, the Danish sculptor, with whom he studied. Crawford's earliest important independent work is the *Orpheus* in the Boston Museum of Fine Arts. There are three statues by him (*Genius of Mirth*, *Mexican Princess*, and *Babes in the Wood*) in the Metropolitan Museum of Art in New York, and the Washington Monument in Richmond, Va., is also his. By far his best-known works are the sculptures commissioned by the United States government for the Capitol in Washington, D.C., which he did not live to complete. These bronzes include the statue of *Armed Freedom* that surmounts the dome, the sculptures in the pediment of the Senate wing, and the pair of bronze doors of the Senate portico with bronze reliefs that contrast the terrors of war with the blessings of peace.

Consult Taft, Lorado, *History of American Sculpture* (New York 1903); Gardner, A. T., *Yankee Stonecutters* (New York 1945).

MARGARETTA SALINGER,
Metropolitan Museum of Art

CRAWFORD, William Harris, American lawyer and public official: b. Amherst County, Va., Feb. 24, 1772; d. Elberton, Ga., Sept. 15, 1834. He went with his family to South Carolina and then, in 1783, to Columbia County, Ga. After teaching school for a time, he studied with Moses Waddel, and then taught again in Augusta. In 1798 he was admitted to the bar and opened a law office in Lexington. He soon became interested in politics, and fought two duels (1802 and 1806) on political questions. In 1803 he was elected to the state legislature, and in 1807 to the United States Senate to fill a vacancy caused by the death of Abraham Baldwin. Re-elected for a full term, he was chosen president of the Senate pro tem. in 1812 on the death of Vice President George Clinton. He was appointed minister to France in 1813, and two years later became secretary of war, and in the following year secretary of the treasury, an office he held until March 1825. He was mentioned as a possible candidate for the presidency several times, and although he was stricken with paralysis in 1823, his friends put forward a plan to have him nominated by caucus. He received the nomination in 1824, and in the election was third among four candidates, with 41 electoral votes. Since none of the candidates had a majority, the election was decided in February 1825 by the House of Representatives, which chose John Quincy Adams. Crawford never wholly recovered his health, although he remained active in politics and served as a circuit judge in Georgia from 1827 until his death.

CRAWFORD NOTCH, mountain pass, New Hampshire, situated in Carroll County, west of the Presidential Range in the White Mountains. About five miles long, it is located

at an elevation of about 2,000 feet above the Saco River, which rises here. The pass was discovered in 1771, and the surrounding area was made a state forest in 1911. Its scenic beauty attracts many visitors.

CRAWFORDSVILLE, city, Indiana, seat of Montgomery County, situated at an altitude of 740 feet, on Sugar Creek, 43 miles west-northwest of Indianapolis. It is served by the Chicago, Indianapolis and Louisville, the Pennsylvania (freight only), and the New York Central railroads. The city is the trading center for an agricultural, livestock (pig and poultry), and dairying region, and has establishments processing food, and manufacturing wire and nails, brick and tile, culverts, shirts, coats, farm implements, lift trucks and skids, poultry roosts and brooders, caskets, and fences. There are also large printing houses.

Crawfordsville is the seat of Wabash College, a men's college founded in 1832. It was the home of Lew Wallace, author of *Ben Hur*, whose study has been preserved by the city as a memorial; of Henry S. Lane, United States senator in Civil War days; and of the novelists Meredith Nicholson and Maurice Thompson. Laid out about 1822, it became a city in 1865 and is governed by a mayor and council. The electric light plant and an airport are municipally owned. Pop. (1950) 12,851.

CRAWL. See **SWIMMING**—*Crawl*.

CRAYER, krá'yēr, Caspar de, Flemish painter: b. Antwerp, Spanish Netherlands, Nov. 18, 1584; d. Ghent, Jan. 27, 1669. A pupil of Raphael van Coxie, he became a member of the Guild of St. Luke in Brussels in 1607. There and in Ghent, where he spent his last years, he executed many works for the Spanish court, from which he received a pension. His paintings, which show the influence of Peter Paul Rubens, are found in many churches and museums in Belgium and elsewhere. Among them are *Christ on the Cross* and *Decapitation of St. John the Baptist* (Cathedral of St. Bavon, Ghent); *The Judgment of Solomon* and *Coronation of St. Rosalie* (Musée des Beaux-Arts, Ghent); an altarpiece, *Adoration of the Magi* (Aerschot); *Adoration of the Shepherds* (Brussels Museum); and *Alexander and Diogenes* (Metropolitan Museum of Art, New York).

CRAYFISH or **CRAWFISH** (Middle English *crevis*, from Old French *crevice*; Fr. *écrevisse*), a freshwater crustacean resembling a small lobster and unrelated to fish. Crayfish attain a length of three to six inches. The head, bearing one pair of long feelers, one pair of short feelers, a pair of stalked eyes, and some feeding appendages around the mouth, is completely fused with the thorax, which is provided with five pairs of walking legs, the first pair terminating in large defensive and aggressive claws (chela). This head-thorax region (cephalothorax) is distinctly separated from the jointed abdomen, which ends in a broad tail fin and bears on its underside swimming appendages or swimmerets, one pair to each joint.

Crayfish walk about, mostly at night, on their walking legs, but if alarmed give a sudden backward dart by flipping the tail fin under the abdomen. They eat almost anything, chiefly all kinds

of vegetation, but also animal food if available, and are generally regarded as scavengers. The sexes are separate and are easily distinguished by external anatomical differences. Mating occurs during the warmer part of the year. Before laying the eggs, the female cleans the abdomen thoroughly and exudes a sticky substance. Then, while lying on her back, she emits the eggs and glues them to the swimmerets. A female thus carrying eggs on her swimmerets is said to be in berry, and this condition is usually seen in spring and early summer. The eggs hatch after some weeks into tiny crayfish that remain with the mother for some time before taking off for a free existence. They molt several times before attaining the adult state.

Crayfish are aquatic, living in lakes, ponds, sloughs, and streams, mostly hiding by day under stones and coming out at night to feed. Some, however, inhabit swampy places and wet meadows that are not under water. Here they live in burrows constructed at night and marked by chimneys of mud thrown up around the entrance. They may be so numerous in poorly drained lands as to interfere seriously with agricultural processes. Some species are confined to cave waters, and these are small, slender, and translucent or whitish, with degenerated eyes (see also **CAVE ANIMALS**—*Blind Inhabitants*). About 130 species of crayfish are known in the United States.

For further information and extensive references on crayfish consult Pennak, R. W., "Decapoda," *Fresh-Water Invertebrates of the United States* (New York 1953).

L. H. HYMAN,
Department of Living Invertebrates, American Museum of Natural History.

CRAYFORD, urban district, England, situated in Kent, on the Cray River, 2 miles west of Dartford and 12 miles east-southeast of London. It is part of Greater London. Primarily a residential community, it also has flour mills, petroleum refineries, and plants processing wool. Points of interest include a pre-Norman manor and a 15th century church. Pop. (1951) 27,951.

CRAYON, Geoffrey, a pseudonym of Washington Irving (q.v.).

CRAYON, a pencil-like implement for marking or drawing, made of chalk, wax, or a combination of wax and clay (the so-called pressed crayon), and colored by the admixture of pigments. The chalk type is of ancient origin; it was used by most of the old masters in red, white, or black, and is now employed in a wide range of colors for pastel drawing. These crayons produce softer tone effects than oils or water colors. Their disadvantage lies in their physical delicacy. Because they smudge so easily, pastel drawings, to be preserved, must be kept under glass or sprayed with a fixative. Pastel crayons are made by mixing chalk and coloring materials with gum water to make a paste, which is then formed in the desired shape and dried. The wax varieties, developed in the latter part of the 19th century, are universally used in industry, in homes, and in elementary art courses, and are produced in by far the greater volume. Because of their widespread use by children, most wax crayons in the United States are now made entirely of non-toxic ingredients, and are so labeled. The most recent development is the wash-off

crayon, the composition of which is held to be a trade secret, but is generally understood to include the use of a soap base. A lithographic crayon is a black composition used for drawing on stones or plates for reproduction by lithography. It consists of soap, wax, resins, and lampblack, melted together. Crayon sticks are manufactured in various shapes, such as round, hexagonal, and square. Most, however, are made in the form of a cylinder, with the wax varieties usually encased in paper jackets.

CRAZY HORSE (Indian name TASHUNCA-UTCO), American Indian chief: b. about 1849; d. Fort Robinson, Nebr., Sept. 5, 1877. Little is known of his early life, but he probably fought with Red Cloud in Wyoming in 1866-1868. As chief of the Oglala tribe of Sioux, he was a leader in the Sioux War which broke out in 1876. This outbreak was due to several causes, chief of which was the occupancy of the Black Hills of South Dakota by white prospectors. The War Department had ordered the Indians to return to their reservations by Jan. 1, 1876, but Crazy Horse and his followers refused to do so. On March 17, Gen. Joseph J. Reynolds surprised the Oglala at their village near the mouth of the Little Powder River and destroyed it, but the Indians escaped and recaptured most of the ponies which had been taken away. In an engagement fought at Rosebud Creek on June 17, Crazy Horse, leading a force of about 1,200 Sioux and Cheyenne, compelled Gen. George Crook to retreat. He then strengthened his band with Indians from the various reservations, and others joined Sitting Bull in Dakota Territory. The two forces were joined on the Little Bighorn River in Montana, and there, on June 25, 1876, they annihilated the command of Gen. George A. Custer. For months thereafter the united bands held the country in terror. On Jan. 8, 1877, Col. Nelson A. Miles attacked Crazy Horse near the headwaters of the Rosebud, but he was able to retire with his band. Soon thereafter, however, the Cheyenne broke away, and Crazy Horse's remaining followers were constantly harried by the army. The pressure finally became so great that, on May 6, 1877, Crazy Horse surrendered with about 1,100 followers at Fort Robinson. Suspected of attempting to lead another outbreak, he was arrested on September 5 and, while attempting to escape, was fatally wounded.

CRAZYWEED. See LOCOWEED.

CREAGH, krā, SIR Garrett O'Moore, British soldier: b. Cahirbane, County Clare, Ireland, April 2, 1848; d. London, England, Aug. 9, 1923. Educated at the Royal Military College, Sandhurst, he became an ensign in the 95th Foot Regiment in 1866. Four years later he transferred to the Indian Army, with which he fought (1879-1880) in the Second Afghan War, receiving a Victoria Cross for bravery. He was stationed on the northwest frontier from 1884 to 1890, and in Aden from 1898 to 1900. In 1899 he was promoted to the rank of brigadier general. He commanded the 2d Brigade in the China Expedition in 1900, and the entire British expeditionary force in China in the following year, after which he returned to India. He was knighted in 1902 and became a major general in 1903, a lieutenant general in 1904, and in 1907, following his return to England, a full general. From 1907 to 1909 he

was assigned to the India Office, and then succeeded Lord Kitchener as commander in chief in India, remaining in this post until his retirement in 1914.

CREAM. See DAIRY PRODUCTS—*Milk*.

CREAM CHEESE. See CHEESE AND CHEESE MAKING; DAIRY PRODUCTS—*Cheese*.

CREAM NUT. See BRAZIL NUT.

CREAM OF TARTAR (also known as POTASSIUM HYDROGEN TARTRATE, POTASSIUM ACID TARTRATE, and POTASSIUM BITARTRATE), a white crystalline compound ($\text{KHC}_4\text{H}_4\text{O}_6$) which is not very soluble in water. At 0°C ., 0.37 grams will dissolve in 100 milliliters of water, and at 100°C ., 6.1 grams will dissolve in 100 milliliters of water. The specific gravity is 1.956. Potassium acid tartrate is formed when one of the two acid hydrogen atoms in dibasic tartaric acid is replaced by potassium; when both hydrogen atoms are replaced, potassium tartrate is formed.

Most tartrates are obtained commercially as byproducts of the wine industry, particularly from a certain variety of sour wine. Small quantities are also obtained from the grape juice industry. Tartrates exist in grapes as potassium acid tartrate, calcium tartrate, and, in small quantities, as free tartaric acid. When grapes are crushed and pressed, most tartrates remain in the juice. As the juice stands, crystals of tartrates called argols (see ARGOL) are formed and cling to the sides and the bottom of the container. Fermentation accelerates this process, but it is not absolutely necessary. From argols by repeated crystallization and decolorization with bone black, pure cream of tartar is prepared.

Cream of tartar's relatively low solubility, its acidity, and its edibility when pure make it a logical choice for the acid ingredient in the acid-soda type of baking powder (q.v.). It is widely used for this purpose in commercial baking powders, which contain sodium bicarbonate and cream of tartar in proportion to their molecular weights, and an inert material such as starch or flour to prevent premature reaction. Medically, cream of tartar is used as tartar emetic, which contains three parts of antimony oxide and four parts of cream of tartar, and as potassium borotartrate or soluble cream of tartar, which contains two parts of borax and five parts of cream of tartar. It is also used in calico printing and as a mordant in wool dyeing.

See also TARTARIC ACID.

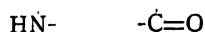
PAULINE DIAMOND.

CREAM SEPARATOR. See CENTRIFUGAL; FARM MACHINERY—*Specialized Equipment*.

CREASY, krē'sī, SIR Edward Shepherd, English historian: b. Bexley, England, Sept. 12, 1812; d. London, Jan. 27, 1878. He was educated at Eton College and at King's College, Cambridge University, of which he became a fellow in 1834. Three years later he was called to the bar at Lincoln's Inn, and for several years was a member of the home circuit (London and vicinity). In 1840 he was appointed professor of history at the University of London, and in 1860 was knighted and made chief justice of Ceylon. Because of ill health he returned to England in 1870. Although he was able to resume his post,

he again became ill and retired within two years. Creasy is known chiefly for his *Fifteen Decisive Battles of the World* (q.v., 1851), a work which passed through many editions. He also published *Historical and Critical Account of the Several Invasions of England* (1852); *The History of the Ottoman Turks* (1854-1856); *History of England* (2 vols., 1869-1870); and *Imperial and Colonial Institutions of the British Empire, Including Indian Institutions* (1872).

CREATINE and **CREATININE**, organic nitrogen compounds closely related chemically and biologically. Creatine is found in the tissues of higher animals, while creatinine is an end product of their metabolism. Both are related to amino acids (q.v.). Creatine is alpha methyl-guanidinoacetic acid, $\text{HN}=\text{C}(\text{NH}_2)\text{N}(\text{CH}_3)\text{CH}_2\text{CO}_2\text{H}$, and creatinine is its anhydride derivative, $\text{HN}=\text{C}-\text{N}(\text{CH}_3)\text{CH}_2$.



Creatine may be synthesized from sarcosine, $\text{CH}_3\text{NH}-\text{CH}_2\text{CO}_2\text{H}$, and cyanamide, $\text{H}_2\text{N}-\text{CN}$. It is a crystalline solid and is sparingly soluble in water (1.5 per cent at room temperature). It is much more of a dipolar substance than any amino acid. Guanidine and its alkyl derivatives are strong bases; hence creatine is about 1,000 times as strong a base as it is an acid. Creatine is present in the human body to the extent of 90 to 120 grams (or 300 to 400 milligrams per 100 grams of tissue), 98 per cent of it being in muscles. Approximately 80 per cent of creatine is combined with phosphoric acid as phosphocreatine, an unstable addition product. This combination is of great importance in muscular activity, being broken up with the evolution of energy and re-formed when the muscle is in repose. Contrary to earlier theories that all amino acids could produce creatine, it is now generally believed that it is formed by the interaction of glycine, arginine, and methionine. This conclusion is supported by researches employing the heavy isotope of nitrogen, N^{15} . Creatine is probably formed mainly in the muscles, and is not merely a waste product of protein metabolism.

Creatinine is formed from creatine in acid solution with the loss of water. In water solution with a pH between 5 and 7, creatine and creatinine exist together in equilibrium in equimolecular quantities. Creatine forms a characteristic picrate which is sparingly soluble in water, and whose characteristic yellow color changes to an orange red in the presence of an alkali. The creatine picrate is soluble. Creatinine is present in the animal body in much smaller quantity than creatine, 100 grams of skeletal muscle, for example, containing from 300 to 500 milligrams of creatine and only 10 milligrams of creatinine. The latter is about equally distributed between cells and plasma. While there is relatively little creatinine in the tissues, it is regularly found in the urine, being an end product which the animal body cannot utilize. This is demonstrated by an experimental procedure in which creatinine is labeled with N^{15} and administered to an animal, and all of it is recovered from the urine. On the other hand, creatine similarly labeled is not found in the urine unless the dosage has been very large. When creatine is found in the urine of adult males, it is usually an indication of some sort of abnormal condition such as disturbances in phosphorus metabolism. It is commonly present in

the urine of children, however, and in that of women in pregnancy and during lactation. Creatinine is the next most abundant of nitrogen compounds in urine, an adult male secreting from 1.0 to 1.5 grams per day.

The so-called Folin coefficient is based on the assumption that creatine excretion is constant, and is the amount in milligrams excreted per hour divided by the body weight in kilograms. In men this value is between 20 and 26, except for athletes, whose coefficient is around 30, while for the average woman it is between 14 and 22. The coefficient is thus definitely related to muscular development. Creatinine concentration in the blood is a sign of the status of nonprotein nitrogen excretion.

W. T. READ,
*Chemical Adviser, Research and Development
Division, General Staff, Department of the
Army.*

CREATION (Lat. *creatio*, from *creare*, to create). The doctrines of creation in the various religions of the world are those which describe or explain the origin of the universe, the earth, and man upon it. Most of them appear to represent inferential thinking based on the nature of existence as it is expounded by the several religions, and they furnish the setting in which human life and society are comprehended. Generalizations on such a complex subject are bound to be oversimplifications to which exceptions can be made. Yet it would appear possible to say that a basic difference in views of creation can be observed between those religions in which the superhuman is understood as immanent in the natural process and those in which it is transcendent.

In the ancient polytheisms the universe was considered as alive, and the gods were personifications of elements, forces, and principles which alone explained movement, activity, process, order, and disorder. From such a point of view the gods are immanent within the order of things, and the doctrine of creation is depicted by myths which describe how the present order was achieved and what the place of human society is within it. In the ancient Middle Eastern polytheisms, for example, thought did not and could not reach behind the primordial, static chaos which was envisaged as the dark and watery deeps, or primeval ocean from which the salt and fresh waters come. In Mesopotamia the deeps were personified, and creation was represented as beginning with a process of sexual procreation, producing a series of gods who were the various elements of the universe as then understood. Order was achieved after a cosmic battle in which the younger and active forces won a victory over the static chaos and proceeded to establish world order. Man was created as the slave of the gods to do the menial work of the earth. Life, however, is an uncertain thing, and the creation battle among the forces of nature, while it issued in the initial victory, had to be refought and rewon each year.

The essentials of this view seem also to have been held in Canaan (Syria-Palestine), where the creation was described as a battle between the king of the gods and the primordial dragon of chaos, called Leviathan (Lotan) or Yam (sea). In Egypt the same once-for-all, and yet yearly, and daily, battle was waged by the sun against the dragon of chaos and darkness. Yet in Egypt

life was not seen as so precarious; victory was always assured; society and world order were static and rhythmic, and fixed in the order of creation. Hence other approaches to creation were made which emphasized the fullness of the present order, such as the emergence from the ocean of chaos of the primeval hill on which the sun, the primeval king, began the creation by procreation.

In religions and philosophies evolving from this polytheistic base the tendency was to demythologize the myths and to think in terms of an abstract principle or principles which had infinite existence as the explanation of world order. Thus in Greece various ideas of the basic principle underlying the evolution of the universe were discussed, whether it was water, fire, air, mind (nous), or desire. Yet in every case the principle or principles involved in the creation informed or reshaped a pre-existent entity. In Chinese Taoism creation is the emergence of all things through the activity of Tao, the latter being the substance of life which pervades all living things. Antedating Taoism were the principles of yang (the positive) and yin (the negative), whose interaction created life. In classical Buddhism and Hinduism, however, there is actually no doctrine of creation because the reality of the world as we see it is an illusion, and the only true reality is the incomprehensible and unknowable essence to which the Buddhists refer as nirvana and the Hindus as Brahma. Yet this essence is scarcely transcendent; it is immanent in every being, and if one can speak of a doctrine of creation at all, it would be in terms of the discovery of self.

In Jewish and Christian thought, however, insofar as it is based on the Bible, there is an emphasis on an independent, self-existent Deity Who transcends all that exists and thus is the source or Creator of all that is. Instead of the personification of elements or principles within the universe who can create only by achieving a harmony of wills, as in polytheism, Biblical faith projects a single Deity Who as Creator is utterly distinct from the creation, and as Ruler is not the ruled. ("To whom then will ye liken God? or what likeness will ye compare unto him?" Isaiah 40:18.) Israel had evidently arrived at this view of ultimate power through an interpretation of what had happened in her national life: that is, through an interpretation of historical events. This God had met Israel in history, had delivered her from Egyptian slavery, had formed her into a nation with an order of life provided in a covenant, and had given her a good land in which to dwell. In doing so He had revealed His complete power over all forces of nature and history, and had revealed as well a purpose to be observed in events. Hence Biblical faith was exhibited in the forms of historical tradition.

The creation stories in Genesis 1:1 to 2:4 and the following verses evidently represent a reworking of older materials, the chief purpose being to depict the complete dependence of all that is on God the Lord. Since His power controls all history, what exists springs from Him. As Lord of history, He is the Creator of history, of time, and of nature, which is the arena of history. At this stage of Biblical thinking the independent and self-existent Deity is represented as acting on a pre-existent chaos, but the stage is set for the later assertion that He was the Creator

even of the chaos and had created from nothing (compare II Maccabees 7:28).

The Biblical emphasis on God's relation to history is further reflected in the conception of human life presented in the creation stories. Man was conceived as the greatest of God's creative acts and given the task of ruling over the earthly dominion. The account of creation thus involved a high estimate of the dignity of man and his historical vocation. Freedom of mind and will were given to enable him to fulfill his task and to accept his creaturehood as a service of God in a divinely given vocation. His trouble on earth, however, as Genesis 3 and following chapters point out, results from his refusal to accept his creaturehood in this sense and his use of his freedom to grasp at equality with his Creator and Lord. This he cannot achieve, and the miseries of his existence are interpreted as his punishment. That man is created "in the image of God" (Genesis 1:26-27) thus does not mean that a portion of divine substance (or a spark of the divine) resides in him. God has preserved his independence. Instead, it refers to the dignity, freedom, and royal vocation given man to rule the earth as God rules His universe (compare the 8th Psalm, a poetic interpretation of Genesis 1), while at the same time it points to that in man which enables him alone among all living creatures to live in communion with his Maker. See also GENESIS, BOOK OF.

G. ERNEST WRIGHT,

McCormick Theological Seminary, Chicago

CREATIVE EVOLUTION (Fr. L'ÉVOLUTION CRÉATRICE), a philosophical work of great poetic power by Henri Bergson (q.v.), first published in Paris in 1907 and translated into English in 1911. A reaction from the sweeping claims made for science by Herbert Spencer, it is an attack on the competence of the intellect. Bergson's object is to vindicate the spiritual principle in nature and to assert the superior competence of intuition (q.v.). The intellect, completely at home in a world of inert matter where its principal use is to fashion tools out of solids, is not competent to deal with life and thought because it instinctively treats them as though they too were solids. The intellect treats time in the same way, as though it were a solid, dividing it into a series of separate, successive moments. Real time is beyond the grasp of the intellect; only the intuition can comprehend its smooth, continuous change without division. Bergson objects to the usual concept of evolution because it deals exclusively with the products of evolution, mistaking them for the evolutionary process itself. True evolution is a continuous creation in which an *élan vital* (vital impulse) pushes outward from inside every being, whether plant, animal, or man, in an effort to achieve perfection and freedom. This vital impulse is the source of the energy which impels a being to improve itself and to push over any obstacle which bars the way. It may be diverted or stopped, but the vital impulse is the source of all evolutionary change. Every action and response a being makes is part of its evolutionary process, and a recognition of the vital impulse, obtainable only through the intuition, allows higher beings to direct it fruitfully. The principal objection made to the theory of creative evolution is that its use of a mysterious vital impulse and its substitution of intuition for intellect lead to mysticism. Bergson fore-

saw this danger and denied that it was inevitable. See also BERGSONISM.

CREBILLON, krā-bē-yōn, **Claude Prosper Jolyot de**, French novelist: b. Paris, Feb. 14, 1707; d. there, April 12, 1777. He was the younger son of Prosper Jolyot de Crébillon (q.v.), and succeeded as an author in an age of licentiousness. For his theological allusions in his novels, especially concerning the papal bull *Unigenitus*, he was imprisoned in the Bastille and banished from Paris for five years. By the subtleties with which he excuses licentious principles, Crébillon contributed to diffuse a general corruption of manners, before confined to the higher circles of Parisian society. His own morals, however, appear to have been the opposite of those which he portrayed, and we are told of his cheerfulness, his rectitude of principle and his blameless life. He married Lady Stafford, an English woman, to whom he displayed a fidelity remarkable at this decadent period. Of his works the best are *Lettres de la Marquise* (1732); *Tanzai et Néadarné* (less licentious, but full of now unintelligible allusions); *Les égarements du cœur et de l'esprit* (1736); *Le Sopha* (1745). It is still a disputed point whether he was the author of the *Lettres de la Marquise de Pompadour*. Consult Amanton, C. H., *Particularités sur les deux Crébillon* (Paris 1835).

CREBILLON, Prosper Jolyot de, French dramatist: b. Dijon, France, Feb. 15, 1674; d. Paris, June 17, 1762. His first piece, *La Mort des Enfants de Brute*, was rejected by the players. His *Idoménée* was brought upon the stage in 1705. The faults of the play were overlooked in consideration of the youth of the author and the promising talent which it displayed, and his talents after the appearance of his *Atrée*, in 1707, were loudly applauded. A taste for unnatural declamation had been excited by Corneille's tragedy, *Rodogune*, and this manner was carried to excess by Crébillon in the *Antrée*. In 1709 appeared his *Electre*, which is as declamatory and as intricate as his earlier plays; yet it suited the taste of the age. His *chef-d'œuvre*, at least according to La Harpe, is his *Rhadamiste* (1711). In eight days the *Rhadamiste* passed through two editions, and Paris and Versailles vied with each other in admiring it. Crébillon had been told that his talent lay in the terrible, and thought, therefore, that he could not exert himself too much in scenes of horror. *Xerxes* (1714) exceeded in this respect all that he had before written, but soon disappeared from the stage. *Semiramis* (1717) was severely censured, but *Pyrrius* appeared in 1726 and met with a good reception, contrary to the expectation of the author, who, in this work, had abstained from the frightful and the shocking. When Madame de Pompadour wished to humble Voltaire, Crébillon was thought of as a fit instrument for her purpose. The king gave him the office of censor of the police, a yearly pension of 1,000 francs, and an appointment in the library. Thus freed from pecuniary anxiety, he finished his *Catiline*, which was represented in 1749 with all the pomp that the court theater could display. To make some atonement to the character of Cicero, thought to have been wronged in his *Catiline*, he wrote at 76 the *Triumvirate, or the Death of Cicero*, which was

brought upon the stage in his 81st year. The defects of this piece were overlooked, from respect to the age of the author. In general Crébillon shows none of the true elevation of the tragic art, but only an imitation, sometimes a happy one, of the manner struck out by Corneille. He was a man of a proud and independent character, disdained to flatter the great, and passed much of his life in a condition bordering on poverty. In 1731 he became a member of the Academy. His works were edited best by Didot (1812). There is a Life by the Abbé de la Porte, and a fine essay by Brunetière in *Époques de théâtre français*.

CRECHE, krāsh (Fr. "crib," "manger"), a sort of public nursery where, for a small payment or, as in America, usually for nothing, the children of women who have to go out to work are fed, nursed and taken care of during the work hours of the day.

CRECY-EN-PONTHIEU, krā-sē ōn pōn-tièy, or **CRESSY**, a village in the French Department of Somme, on the Maye, 12 miles north of Abbeville. Crécy has a 15th century church and is celebrated on account of the brilliant victory obtained here, Aug. 26, 1346, by Edward III, with 40,000 English soldiers, over a French army amounting, according to Froissart, to 100,000 men under the command of the Count of Alençon. In this great battle perished the flower of the French chivalry, as well as the blind king of Bohemia, who was fighting on the side of France. The Black Prince distinguished himself greatly, bore the brunt of the fight, and gained his spurs. After this battle, tradition says, the Black Prince assumed the crest of the slain king of Bohemia, which consisted of three ostrich feathers with the motto *Ich dien*, "I serve," but this is more than doubtful. The Battle of Crécy was one of the first in which cannon were used by English troops. Pop. about 1,400. Consult George, *Battles of English History* (New York 1895); and Oman, *History of the Art of War* (London 1898).

CREDENCE, a small table placed near the altar or communion table, at its south side, on which the bread and wine intended for consecration are placed in readiness. In this connection it is used especially in the Roman Catholic and Episcopal churches. In the Greek Church this is called the *trapeza protheseos*, or simply *prothesis*, but is always placed north of the altar, usually in a structural side-chapel. It was sometimes used in the English Church. The word is generally used to denote a small side table or buffet, on which dishes were placed or kept before meals.

CREDI, krā'dē, **Lorenzo di**, Italian artist: b. Florence, 1459; d. there, Jan. 12, 1537. He was a fellow pupil of Leonardo da Vinci in the school of Verrocchio, and so closely followed his style that some of his copies of Leonardo's works are scarcely to be distinguished from the originals. His *Holy Families*, of which he painted a great number for private collections, are gracefully designed and highly finished. His most esteemed works are a *Madonna and Child with Saints Julian and Nicholas*, now in the Louvre, and the *Nativity* at Florence. Two very fine works are the *Annunciation* and

the *Venus* in the Uffizi Gallery in Florence, Italy. The Metropolitan Museum of Art in New York has a *Madonna Adoring the Christ Child*, and in the Gardner Museum of Art in Boston, Mass., there is a beautiful boy's head. Credi also did some sculpture and was designated by Andrea del Verrocchio to complete his Colleoni Monument.

CREDIT, Economic. The word *credit* is derived from the Latin base meaning "faith" or "trust." In economics and finance the term is used specifically to refer to the faith placed by a creditor (lender) in a debtor (borrower) by extending a loan to the debtor. In a modern, complex market economy, the loan is usually in the form of money. When a loan is made, the lender extends credit to the borrower, while at the same time accepting the credit of the borrower. A market economy, such as exists in the United States, could not function without extensive use of credit based almost exclusively upon the faith and trust of the participating buyers and sellers. In addition, the existence of readily salable commodities or collateral in the hands of the borrower tends to increase the amount of credit which may be extended to him by adding to his means of repayment.

Credit performs two primary functions. The first consists in facilitating the transfer of capital or money, thereby increasing the productivity of capital by placing it where it will be most effectively and efficiently used. The second function is that of economizing on the use of currency or coin money.

A highly developed credit system is necessary for the widespread use of credit. The credit system functions for the purpose of facilitating the transfer of credit instruments, as well as for the extension of credit. Credit instruments take such forms as promissory notes, bonds, and bills of exchange. A check is a specialized type of bill of exchange. In order to perform their function of transferring credit adequately, credit instruments must be fully and readily negotiable. Negotiability depends upon acceptability, and acceptability in turn depends on the faith which constitutes the ultimate basis of credit. (See also **COMMERCIAL PAPER**.)

An actual loan need not be made for credit to be utilized in economic activity. Credit supplies the modern world with the bulk of its media of payment, or money. Bank demand deposits or checking accounts constitute the largest segment of the money supply of the United States, and over 90 per cent of the dollar volume of money payments in the United States is accounted for by checks. Checking account deposits are simply liabilities of commercial banks, and only the universal acceptability of bank credit permits them to function as money. In addition, virtually all of the paper money in the United States, which comprises all but a negligible portion of the total currency in circulation, is credit money. Each bill is simply a promise to pay by the United States government or by one of the Federal Reserve banks. The faith of the general public in the ability of the issuer to make good its promise on demand is the foundation of the bulk of the money supply in the United States.

Bank credit is a peculiar feature of a highly organized market economy. Because commercial banks serve clearing houses for the financial transactions of many persons and businesses, the credit of a bank is accepted in many instances

where that of an individual or private business would not be. A commercial bank can also create credit, and hence money. When a commercial bank lends money, it sets up a checking account in the name of the borrower for the amount of the loan, thereby substituting its own credit for that of the borrower. The important difference is that commercial bank credit is more generally acceptable and functions as money.

Various kinds of credit institutions have been developed to handle the specialized problems of such different types of credit extension as consumer installment borrowing, real estate mortgages, and government bonds. This specialization has further expanded the use of credit in the United States, with the result that greater development of organized markets and of large-scale enterprise has been possible.

See also **BANKS AND FINANCE—3. The Role of Credit; CURRENCY; DEBT; DEBT, ACTION OF; DEBTOR AND CREDITOR, LAWS OF; FEDERAL RESERVE SYSTEM; INFLATION AND DEFLATION; MONEY; PUBLIC FINANCE.**

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WILLIAM N. KINNARD, JR.,

Economics Department, Wesleyan University.

CREDIT, Letter of, an order given by bankers or others at one place to enable a person to receive money from their agent or agents at another place. When the letter or notification is addressed to the person who is to receive the credit and authorizes him to draw up to a certain sum, it is called a *commercial or confirmed letter of credit*; when the letter is addressed by the original banker to a correspondent or agent, it is called a *traveler's letter of credit*; and when the document is an order on more than one person or firm, it is known as a *circular letter of credit*.

CREDIT INSURANCE. See **INSURANCE, CREDIT.**

CREDIT MOBILIER, krâ-dê mô-bê-lyâ'; Eng. kréd'it mô-bê-lyê', a large company founded in France in 1852 by Jacob Émile Pereire and Isaac Pereire and sanctioned by the then existing government. Incorporated under the name of Société générale du crédit mobilier, the company's object was to advance new industrial enterprises through loans and the purchase of stock. It bought shares in public companies and paid demands upon it with its own shares. At the time of its formation the company had a capital of 60 million francs and soon was doing an extensive business. In 1855 the directors proposed to issue bonds to the amount of 240 million francs, but so large an issue aroused public alarm and the scheme was forbidden by the government. The prosperity of the company, which gave important help in developing the industry of France,

declined after this time, and in 1871 the management was changed.

CREDIT MOBILIER OF AMERICA, the cause of one of the most serious legislative scandals in American history. The United States government in 1864 granted a charter to the Union Pacific Railroad (q.v.), with a capitalization of \$100 million, to complete a transcontinental line west from the Missouri River, and offered to assist it by a loan of \$16,000 to \$48,000 a mile according to location and a land grant of 20 million acres, the latter worth \$50 million to \$100 million. Even this offer attracted few subscribers, since the project meant building hundreds of miles of road through mountains and deserts, at an enormous cost of freightage for supplies, amid frequent bloody encounters with the Indians, and with no probable early return on investment. Shortly thereafter, a House committee, of which Representative Oakes Ames of Massachusetts was a member, added an authorization to the railroad to issue its own bonds dollar for dollar with the government's, the former to be first mortgage bonds and the latter second. In other words, the government assumed all the risk.

The stock of the railroad, nevertheless, had no marketable value in its own right as an investment, but only through the government's offers to pay in excess of the probable cost, which made it worth while for capitalists to take up the stock and earn these offers. Ames, also a director of the railroad, and a few associates knew that the cost of the undertaking would not come to the full amount of the government's loan and gift together. To gain possession of the balance, they decided to form the stockholders of the Union Pacific into a duplicate corporation under another name. This corporation would actually construct the railroad, and to it the railroad company would turn over its bonds and stocks as payment for work and supplies. In March 1864 an inner circle of the railroad bought up a moribund Philadelphia concern called the Pennsylvania Fiscal Agency, which had been originally chartered in 1859, and the Pennsylvania legislature authorized the new name, *Crédit Mobilier of America*. Union Pacific stockholders took the same amount of stock in the construction company as in the railroad.

In 1866 the government extended its offer of grants to such mileage as the Central Pacific should build east from its California lines, and the two companies began a race to secure the benefits. Probably the *Central Pacific* gained as much profit as the *Crédit Mobilier*, but its profits were legitimately earned for its stockholders. Even the *Crédit Mobilier*'s action would not have been so unsavory if the collusion between government directors and public representatives had not occurred. By the time the railroad was completed in 1869, the *Crédit Mobilier* had accumulated huge profits while the Union Pacific Railroad was greatly in debt. The report of the trustees of *Crédit Mobilier* stated that they had realized a profit of about \$23 million, but this was definitely an understatement and did not cover the full period of operations.

In the midst of the undertaking the promoters began to quarrel bitterly over the division of spoils, and outsiders demanded a share in the profits as the price of silence or assistance. Representative Elihu B. Washburne of Illinois moved an investigation and the fixing of transportation

rates, and in alarm Ames took out 343 shares of *Crédit Mobilier* stock, then commanding a 100 per cent premium, and sold at least 160 of these shares at par to congressmen and other leading government officials. In a phrase that became classic, he said that he would put the shares "where they will do most good. . . ."

In the latter part of 1867 the quarrel of an outsider, Col. H. S. McComb, with Ames laid the mine for the final explosion. McComb asserted his right to 375 shares, and to quiet him Ames told him the names of the public men to whom he had "sold" the stock. McComb bided his time and during the presidential campaign of 1872 filed affidavits alleging the misuse of the stock by Ames. On Sept. 4, 1872, the *New York Sun* published the letters of Ames to McComb which gave the names of those supposedly implicated in these dealings. The list included among others the names of such prominent men as Schuyler Colfax, the vice president of the United States and formerly speaker of the House; Henry Wilson, the vice president-elect and a senator from Massachusetts; James G. Blaine, the speaker of the House; James W. Patterson, senator from New Hampshire; James Brooks, representative from New York; and James A. Garfield, representative from Ohio.

When the third session of the 42d Congress opened in December 1872, Blaine descended to the floor of the House and demanded a committee of investigation; a committee was appointed with Luke P. Poland of Vermont as chairman. The Poland Committee made a report on Feb. 18, 1873, which established the fact that the speaker had been offered stock but had refused to touch it, as had Roscoe Conkling, James A. Bayard, and George S. Boutwell. Other officials had taken the stock but had returned it when lawsuits were threatened, without retaining the dividends; some had kept the stock and had justified their action as a sound business investment; others had kept the stock and the dividends until investigation was imminent; and a few had kept both the stock and the dividends and had attempted to deny or explain away their ownership. The report of the committee recommended the expulsion of Representative Ames and found him "guilty of selling to members of Congress" shares of the *Crédit Mobilier* at prices below their value, with the intent "to influence the votes and decisions of such members in matters to be brought before Congress for action." The committee also recommended the expulsion of Representative Brooks, a government director of the Union Pacific, for using his position to obtain stock for himself and his family. The report of the Poland Committee further stated that Colfax and Garfield had been directly involved and had received financial gain, although both men had previously testified to the committee that they had had no connection with the dealings. The vote in the House on the Poland report, however, was deferred for a week, and the House merely censured both Ames and Brooks, both of whom by a strange coincidence died shortly after, only a week apart. In the Senate an investigating committee recommended the expulsion of Senator Patterson, but no action was taken since the session was shortly to end. These revelations, together with other unsavory events of the first Grant administration, put the Republican Party on the defensive in the election of 1872; nevertheless, the scandal had little effect then on

Grant's popularity and he was re-elected by a plurality of over 700,000.

Consult Crawford, J. B., *The Crédit Mobilier of America* (Boston 1880); Hazard, Rowland, *The Crédit Mobilier of America* (Providence 1881); Rhodes, James Ford, *History of the United States*, vol. 7 (New York 1906); Oberholtzer, E. P., *History of the United States Since the Civil War*, vol. 2 (New York 1922).

CREDITON, kréd'i-t'n, village, Devonshire, England, is located about 8 miles northwest of Exeter. Formerly called Credington, Cryditon, and Kirton, the town is situated on the river Creedy near its junction with the Exe. It is usually thought to have been the birthplace of St. Boniface. From 909 to 1050, Crediton was the seat of a bishopric which was later moved to Exeter. The region around Crediton has long been famous for its spinning and weaving, in wools and also in fine lace. The most distinctive landmark of the town is the old Norman church. The old grammar school was founded by Edward VI. Pop. (urban district, 1951) 3,992.

CREE INDIANS, a tribe of North American Indians of Algonquian stock (q.v.) now settled on several reservations in Manitoba but formerly living in a region ranging from the southwestern borders of Hudson Bay southward and westward to the area about Lake Winnipeg and the Saskatchewan River. Before the arrival of white men, the Cree were settled only near Hudson Bay; later certain groups moved southward onto the prairies, thus forming two major divisions in the tribe, the Woodland or Swamp Cree to the northeast and the Plains Cree on the prairies. The Cree have traditionally been on friendly terms with the Assiniboin and with the French and English, but until brought under government control, they were constantly at war with the Sioux and Blackfoot Indians. Their culture is typically that of the eastland woodland, and they have a reputation as shrewd traders.

CREEDS AND CONFESSIONS (Lat. *credo*, I believe; *confessio*, I confess), formularies of doctrine, articles of belief, or affirmations of faith, for subscription or public use, setting forth with authority dogmas regarded by Christian churches as essential to the Christian faith.

The familiar confessional formulary common throughout nearly all Western Christendom is the Apostles' Creed (*Symbolum Apostolorum*), so called because of the widespread medieval assumption that it was composed by the 12 apostles. Renaissance scholarship initiated an attack upon the authenticity of this ancient tradition, and in time virtually all Christians have come to regard the tradition as a pious legend. The creed may still be properly linked with the apostles, however, because its teaching reproduces the authentic apostolic doctrine of the primitive Christian church. The precise form in which the Apostles' Creed is now used dates from the early years of the 8th century, but it is clear from the creeds quoted by Tyrannius Rufinus about 404 and by Marcellus of Ancyra, 60 years earlier, that the 8th century form is only a more mature variant of the ancient baptismal creed of the Roman church. Its ancestry, therefore, can be traced back through the baptismal interrogations of Hippolytus in the 3d century to the "rule of faith" in the writings of Tertullian, Irenaeus, and other church fathers still earlier. Substantially all the affirmations of the Apostles' Creed are found in the 2d century

expansions of the brief creedal forms present in the New Testament itself (Mark 8:29; Acts 8:36-38; Romans 10:9; 1 Corinthians 12:3).

The more developed theological formulary known as the Nicene Creed, commonly used in the liturgies of Eastern Orthodoxy and the Western Catholic churches, was put forth in its earliest form by the bishops assembled in the ecumenical Council of Nicaea in 325. A revision of older creeds by the addition of phrases that dealt authoritatively with the doctrinal disputes of the early 4th century, the Nicene Creed is current today in the more elaborate form given it by the Council of Constantinople in 381 and affirmed by the Council of Chalcedon in 451. Thus bearing the authority of the ecumenical councils, the Nicene Creed in its ancient form has remained the doctrinal standard of Eastern Orthodox churches.

Since the 9th century the Nicene Creed as recited in Western Christianity has differed from the older and Eastern Orthodox form by the use of the term *filioque*, meaning "and the Son." The introduction of this phrase as early as the Spanish Council of Toledo in 589 witnesses to the belief of Western theologians that the Holy Ghost proceeds "from the Father and the Son." This doctrine gradually spread throughout the West, and the use of *filioque* was by the 9th century the subject of such controversy between Constantinople and Rome that it contributed to the ultimate separation between the Orthodox East and the Catholic West.

A third important creed was the Athanasian Creed, which was derived from an exposition of the Nicene Creed and states, in 40 theses, the doctrines of the Trinity and the Incarnation. St. Athanasius was undoubtedly not its author, and probably the creed was of Western origin, perhaps from before the time of St. Augustine.

Eastern confessions or theological articles have been issued from time to time, the most controversial being the Confession of Faith of 1629, ascribed to Cyril Lucaris. Containing evident signs of Western Protestant (Calvinist) influence, this confession was condemned by the Synod of Jerusalem in 1672. Of more lasting importance are the "Symbolic Books" of Orthodoxy, consisting of the Confession of Gennadius II (Georgios Scholarios), 1453, an exposition of the Orthodox faith for Moslems; the Answers of Jeremiah II, 1576-1581, containing the replies of the patriarch of Constantinople to overtures from Lutheran theologians; the Confession of Metrophanes, 1625; the Orthodox Confession of Peter Mogila, 1640-1643; and the Confession of Dositheus, 1672, all of which set forth the teaching of Eastern Orthodoxy as compared with the doctrines of Western churches. While these documents lack the authority of the ancient ecumenical councils, they are received in Eastern churches with great respect because they are considered to express doctrine consonant with the conciliar decrees and the teaching of the fathers.

The period of the 16th century Reformation (q.v.) saw the appearance of numerous confessions and articles of belief setting forth the doctrinal position of Reformation churches. The basic Lutheran articles were published in the Augsburg Confession (*Confessio Augustana*), drawn up by Philipp Melanchthon, revised by Martin Luther, and presented to the Emperor Charles V at the Diet of Augsburg in 1530. Other documents of Lutheran confessional theology are Melanchthon's *Apologia Confessionis*

Augustanae; the Schmalkaldic Articles and the Wittenberg Concord of 1536; the Wurttemberg Confession of 1552; and the Formula of Concord promulgated in 1580.

Among the Reformed confessions (Zwinglian or Calvinist), as distinguished from the Lutheran, are the Tetrapolitan Confession (The Confession of the Four Cities--Strassburg, Constance, Memmingen, and Lindau), drawn up by Martin Bucer in 1530; John Calvin's *Consensus Tigurinus*, 1549; the Gallican, Scots, and Belgic confessions, 1559-1561; and Heinrich Bullinger's second Helvetic Confession of 1566, which reflected the doctrinal agreement reached earlier between Zwinglians and Calvinists, and assumed international significance among the Reformed churches. In 1646 the Westminster Confession was drawn up as the authoritative set of doctrinal articles for English and Scottish Presbyterians.

The course of Reformation thought in the Church of England may be traced through the conservative articles published in the reign of Henry VIII, of which the Ten Articles of 1536 and the King's Book of 1543 are the most important; the Forty-Two Articles of 1553, revealing the extent of continental Protestant influence in England in the reign of Edward VI; and the Thirty-Nine Articles of 1563 (revised 1571), reflecting the position of the Elizabethan church in respect to certain doctrines prominent in the controversies of the 16th century.

Confessional theology was characteristic of Roman Catholic intellectual activity in the Reformation period, and Counter Reformation (q.v.) articles are found in the decrees of the Council of Trent, promulgated by Pius IV in 1564 together with the Tridentine Profession of Faith, sometimes called "The Creed of Pius IV." To these summary statements of the distinctive features of the doctrinal system of the Church of Rome should be added the dogmas of the Immaculate Conception of the Blessed Virgin, declared in 1854; of Papal Infallibility, decreed in the Vatican Council of 1870; and of the Assumption of the Blessed Virgin, promulgated in 1950.

See also CHRISTIAN DOCTRINE; DEVELOPMENT OF CHRISTIANITY; CHRISTOLOGY.

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POWELL M. DAWLEY,
Professor of Ecclesiastical History, The General
Theological Seminary, New York.

CREEKS, one of the most important confederacies of American Indians living north of Mexico. At one time the Creeks occupied the greater part of the present states of Georgia and Alabama and constituted one of the two largest divisions of the Muskogean linguistic stock to which they also gave their name.

When South Carolina was settled by the English in 1670, that section of the Creek Indian tribe later known as the Lower Creeks was living principally on the upper course of the Ocmulgee River, then called by the white colonists Ochee Creek. The Indians there came to be known to them as Ochee Creek Indians, and later this name was simplified to Creeks. The

name Muskogee, Muscogee, or Muscogulgee later applied to them seems to have been given by Shawnee Indians and designates a swampy country or one filled with creeks.

The Muskogee proper who formed the nucleus of the confederation consisted of a number of related tribes including the Coosa, Coweta, Kasihta, and several others, which were increased in later times by the addition of the Alabama, Koasati, Hitchiti, and fragments of the Yamassee and Natchez of the same linguistic family, the unrelated Yuchi (or Uchee), and, temporarily, bands of Shawnee. In the 18th century, some of the Creeks moved into Florida and became the nucleus of the Seminole ("Out-settlers") who were later increased by further secessions, particularly after the Creek War of 1813-1814.

Early estimates indicated a Creek population of 10,000-12,000, with possibly 3,000 warriors. This number was increased by additions from other tribes to about 20,000 in 1833 just before the removal of the Creeks west of the Mississippi River, and the increase came in spite of defections to Florida. When they moved to what is now Oklahoma, the Creeks became reduced to about 12,000, not including freedmen. In 1945 approximately 9,900 Creeks were reported to be living in Oklahoma and subject to government supervision.

Except when fortified in time of war, each Creek village in the region of original settlement consisted of a neighborhood of widely scattered houses. Each family usually had two houses. The winter house was circular and thatched with bark or grass, and around the inner wall ran a raised platform upon which the occupants slept at night warmed by a central fire. In summer the Creeks lived in oblong buildings ranged, if there were more than one in a group, around an open fireplace. Usually the summer ceremonial ground contained four cabins in which chiefs, warriors, and commons were seated in accordance with their rank.

A few Creek tribes were mentioned by the chroniclers in the expedition of Hernando de Soto, and the foundations of the confederation may have been laid by then (1540), although this fact is uncertain. In the late 17th and early 18th centuries, the Creeks found themselves confronted with settlements of three different European nations on their borders, and, especially under the clever strategy of a semidictator, the mixed-blooded Alexander McGillivray, they learned how to play off one nation against another. The possibility of such manipulation was practically ended by the withdrawal of France from North America and the cession of Florida to England by Spain in 1763. When the American Revolution broke out the Creeks sided with the English and gave refuge to many Tories, but in 1790 their principal chiefs were induced to visit New York and a peace was concluded with the new United States government. After 1763 some Indians of the confederacy, including the major part of the Alabama and Koasati, began to move into Louisiana, and some passed on into Texas where the Alabama later obtained a reservation and still live.

Earlier friendship with the British and the influence of Tecumseh caused a large section of the Creeks, mainly those living on the Tallapoosa River, to rise against the whites after the beginning of the War of 1812. On Aug. 30, 1813, Fort Mims was captured by Creek Indians and

its garrison massacred. In the Creek War which followed, Andrew Jackson defeated the main forces of the hostile Indians in battles at Talladega and Horseshoe Bend, Ala. He was assisted by the Lower Creeks, and in the last and most sanguinary encounter of March 27, 1814, at Horseshoe Bend, by the Cherokee. Over 2,000 warriors were killed in this war, their lands ravaged, and many of their towns burned. The head towns and official governing bodies of the nation, however, did not take part in the hostilities.

As a result of this war the Creeks were compelled to cede a large part of their territory, and pressure by the Georgians for their removal was vastly increased. A section of the nation headed by William McIntosh, who claimed that his town Coweta had a paramount position in the confederacy, signed a treaty at Indian Springs, Ga., on Feb. 12, 1825, ceding all Creek lands in Georgia and part of those in Alabama to the federal government. For this act, regarded as treason to the nation as a whole, McIntosh was killed by a body of Indians from the Upper towns. By another treaty, signed Jan. 24, 1826, the Treaty of Indian Springs was declared null and void, but a portion of the Creek lands was ceded to the government, and the remainder was ceded in 1827 and 1832.

Advance groups of Creeks which had already moved across the Mississippi were joined at intervals by others until about 1840 when nearly all had reached the new land granted to them in the northeastern part of Indian Territory, the present Oklahoma. For some years animosities stemming from the Creek War kept the Lower and Upper towns in a state of semihostility, but in course of time a common government was established modeled on that of the United States, with head and second chiefs and two representative bodies.

The most influential chief during this period and one of the greatest of American Indians was Opothleyaholo or Hupuehelth Yahólo of the Upper Creeks, who, when the Civil War broke out, tried to prevent his people from signing a treaty with the Southern Confederacy. Failing in this attempt, he withdrew from the council and was followed by one third of the nation. These Indians were attacked and severely defeated by the Confederate faction, but Opothleyaholo fought his way north to Kansas and settled near the town of Le Roy where he died. After a series of treaties and negotiations the little Creek Republic came to an end and was incorporated in the present state of Oklahoma and the American Union in 1907.

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JOHN R. SWANTON.

CREEL, krēl, George, American publicist and author: b. Lafayette County, Mo., Dec. 1, 1876; d. San Francisco, Calif., Oct. 2, 1953. After working briefly for several midwestern newspapers, Creel in 1898 joined the staff of the *New York Journal*. In 1900 he returned to

Kansas City, Mo., as co-founder of the *Kansas City Independent*, with which he at once began an intensive crusade for clean government. Later he worked on the *Denver Post* and the *Rocky Mountain News*, also in Denver, Colo.

When President Woodrow Wilson created the Committee on Public Information in 1917, he named Creel as its civilian chairman. The committee promoted voluntary censorship, curbed anti-German hysteria, and directed public opinion in a well-integrated propaganda campaign.

In 1933, Creel was appointed chairman of the San Francisco Regional Labor Board. Two years later he was named chairman of the national advisory committee to the Works Progress Administration (WPA). In 1939, President Franklin D. Roosevelt appointed him United States commissioner to the San Francisco International Exposition.

CREEPER, a name applied to various small, oscine birds that creep along the trunks or branches of trees, or over rocks and walls in search of small insects and other food. The true creepers, comprising the family Certhiidae, have tail feathers which are stiffened at their tips and aid them in hitching up the trunks of trees. The birds then flutter down to the base of another tree to repeat the process. The several species of true creepers are found in Europe, Asia, and North America; other creepers are found in Africa and Australia, but they do not seem to be closely related to the true creepers.

The brown creeper (*Certhia familiaris*) of North America is about five inches long and in color and pattern closely resembles the bark of trees. The wall creeper (*Tichodroma*) of the Alps and the mountains of Asia is similar to the nuthatches in the pattern and texture of its plumage, including a soft tail. It is generally considered to be a link between the nuthatches and the true creepers.

CREIGHTON, kri't'n, Mandell, English historian and clergyman: b. Carlisle, England, July 5, 1843; d. Fulham, London, Jan. 14, 1901. He was educated at Merton College, Oxford, was ordained in 1870, and took priest's orders in 1873. From 1875 to 1884 he served as vicar of Embleton, Northumberland, and in the latter year was chosen Dixie professor of ecclesiastical history at Cambridge, being the first occupant of the chair. In 1885 he became canon residentiary of Worcester Cathedral, but in 1891, on his appointment as bishop of Peterborough, vacated both that post and his professorship. In 1897, Creighton was appointed bishop of London, and in this office laid renewed emphasis on ecclesiastical pomp and ritual.

The most important of his numerous historical works is the *History of the Papacy During the Period of the Reformation*, 5 vols. (1882-1894). Other publications of his include *Primer of Roman History* (1875); *Life of Simon de Montfort* (1876); *The Age of Elizabeth* (1876); *Cardinal Wolsey* (1888); *The Early Renaissance in England* (1895); *The English National Character* (1896); *Story of Some English Shires* (1897); *Historical Essays and Reviews* (1902). He was a founder of the *English Historical Review* (1886), and edited it to 1891.

CREIGHTON UNIVERSITY, a Roman Catholic coeducational institution, Omaha, Nebr..

which opened in 1878 and was chartered in 1879. It is named for Edward Creighton, in whose memory his widow endowed the university. There are two undergraduate colleges, Creighton College of Liberal Arts (for men) and University College (for women); a graduate school; colleges of pharmacy and commerce; and schools of law, medicine, nursing, dentistry, and journalism. The average enrollment is 2,400 students.

CRELL, Nikolaus. See KRELL, NIKOLAUS

CREMA, krà'mà, commune, Italy, situated in Lombardy, in Cremona Province, on the Serio River, 23 miles northwest of Cremona. It serves as a market for the rice, livestock, and raw silk produced nearby, and has establishments manufacturing agricultural machinery, textiles, hats, organs, and soap. The seat of a bishopric, it has a cathedral built in 1284-1341 with a Lombard Gothic façade; 16th century palaces; and a number of fine churches, including Santa Maria della Croce, erected in the style of Bramante in 1493-1500. Pop. (1951) 27,936.

CREMATION, the practice of disposing of the dead by burning. The ashes may be buried, cast ceremonially into a river, given mass burial in ossuaries or in individual urns, or scattered.

Prehistoric and Early Historic Practice.—According to the archaeological evidence as interpreted by the British anthropologist V. Gordon Childe, cremation was practiced by Neolithic societies in the British Isles, Brittany, Switzerland, and central Germany, and perhaps in Greece, Syria, and Palestine. Cremation became the preferred method in Britain and northern and central Europe in the Middle to Late Bronze Age (from 1400 B.C.), and in Spain and upper Italy by the Early Iron Age (from 1000 B.C.). It was practiced also at Troy on the Dardanelles, Carchemish on the Euphrates, and occasionally in Crete and Greece, between 1400 and 1000 B.C. In the 1st millennium B.C., both cremation and inhumation (interment) were practiced in most Greek and Italic cities. In western Europe the Celts generally inhumed, while the Teutons in the north still cremated. Since the earliest Phoenician (Semitic) colonists at Motya in Sicily practiced only cremation, it cannot be regarded as an "Aryan" rite. Cremation was never popular in Asia, except in India among the Hindus.

In the Roman Empire cremation at first spread without superseding inhumation, but after 200 A.D. the popularity of cremation tended to decrease even in the European provinces of the empire. Christianity adopted the rite of inhumation practiced in contemporary Palestine by the Hebrews and was influential in diffusing the rite in the empire when the new creed spread there. Cremation remained the favorite rite among Slavonic peoples and the Scandinavian Teutons until their conversion.

On the whole, it may be said that the origin of cremation cannot be connected exclusively with any particular race or people or with a particular level of cultural development. The assertion sometimes put forth that cremation was brought to the Mediterranean region from the East (about 2500-2000 B.C.) seems to be without archaeological or ethnological foundation.

The archaeological evidence also indicates that cremation graves are on the whole no less richly furnished than inhumations. For example, the

richest Bronze Age graves in Britain contain cremated bones, and so do the richest graves in the Early Iron Age cemetery of Hallstatt in Austria. This disproves the notion that the annihilation of the physical remains of the departed was inspired by a more spiritual conception of the soul. It would appear, rather, that animistic beliefs in the survival of the soul and its continued need of physical artifacts after death were compatible with either cremation or inhumation. Only where religious beliefs associated the state of the body with the welfare of the soul, as in the Christian doctrine of the body's redemption and resurrection, was the preservation and conservation of the body a matter of serious concern.

Cremation Among Primitive Peoples.—In primitive cultures which have survived into modern times cremation is widely practiced. Burning is not only supposed to destroy the dead body most effectively and thus to prevent the possible return of the ghost, but since fire serves also as a purifying agency, it is often considered a good means of warding off evil spirits. It must not be supposed, however, that the motives for the prevalence of cremation have been the same in all cases. Besides discouraging the ghost from haunting the corpse and its former abode, and serving as a means of purification from evil spirits and the contamination associated with the dead body, cremation has also, in some instances, as among the Hindus and Chukchi of Siberia, been associated with a belief in a heavenly abode for the spirit of the deceased. The flames of the funeral pyre, leaping upward, are thought to facilitate the ascent of the soul.

While cremation may be the preferred method of disposal of the dead among primitive peoples, lack of fuel often leads to the utilization of other methods. For example, the Chukchi often resort to exposure of the dead, while the Koryak, living farther to the south, adopt cremation when practicable, but throw their dead into the sea from a steep rock when there is a dearth of fuel.

Among the North American Indians we find a great diversity of methods for disposing of the dead. Cremation, when practiced, tended to be limited to special classes of individuals. Among the Miami, for example, victims of witchcraft were cremated. Among the Potawatomi and Ottawa only members of the Rabbit or Great Hare gens burned their dead. The Ojibway burned the bodies of warriors slain in battle. The Menomini burned the corpses of persons dying of scrofula or kindred diseases in order to consume the worms supposed to have caused the disease. If a Choctaw died away from home and it was impracticable to bring the body back, the ashes or bones of the dead were returned instead.

Among South American Indians, cremation is not widespread and occurs primarily north of the Amazon, in the Guianas and Colombia. Some tribes, such as the Aparai, cremate only chiefs and medicine men. Others, notably the Roamaina, cremated the men only, by setting their houses afire, and buried their ashes in an urn.

Cremation in Modern Cultures.—In modern civilizations cremation is practiced largely for hygienic reasons and because of lack of space owing to the great increase of population, especially in the cities. Since the Christian Church, especially in its Roman Catholic and Greek Orthodox forms, has been opposed on principle to cremation, it was not until the latter part of the 19th and the early 20th centuries that the

practice was legalized in European countries and North America. The Cremation Act of 1902 first made statutory provision for cremation in Great Britain, although it was lawful to practice it as early as 1884-1885.

Cremation is now permitted either by law or by custom among about three fourths of the inhabitants of the world. Modern India (Hindu), Japan, Korea, and Indochina (Buddhist) tend to practice cremation. The Protestant countries of western Europe as well as the United States, Canada, and Australia have a considerable number of crematoria regulated by law. In some instances, as in Australia, cremations average as high as 23 per cent of deaths. Cremation in the Western World is usually associated with urn burial of the ashes. In parts of the Eastern World, as in India, the ashes are cast ceremonially into a river. See also DEATH CUSTOMS AND RITES.

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DAVID BIDNEY,
Associate Professor of Anthropology and Philosophy, Indiana University.

CREMAZIE, krâ-mâ-zê', (Joseph) Octave, French-Canadian poet: b. Quebec, Lower Canada, Nov. 8, 1822; d. Le Havre, France, Jan. 16, 1879. He was educated at Quebec Seminary, and about 1848 became associated with his brothers in a bookselling business. He contributed a number of poems to the *Journal de Québec*, the best known being *Le vieux soldat canadien* (1855), and his shop became a meeting place for young French-Canadian writers. In 1862 financial reverses forced him to seek refuge in France, where he spent the rest of his life under an assumed name. Crémazie has been called "the father of French-Canadian poetry." In 1883 his friends published his *Oeuvres complètes*.

CREMER, krê-mêr, Sir William Randal, English pacifist: b. Fareham, Wiltshire, England, March 18, 1838; d. London, July 22, 1908. Apprenticed to a carpenter at the age of 15, he was a founder of the Amalgamated Society of Carpenters and Joiners (1860). He became an ardent advocate of world peace, and served as secretary of the Workmen's Peace Association from 1871 to 1908, edited the *Arbitrator* from 1889, and did much to further international arbitration. He was also secretary of the Inter-parliamentary Union from 1889. He served in Parliament from 1885 to 1895 and from 1900 until his death. He was awarded the Nobel Peace Prize for 1903, and gave £7,000 of the £8,000 he received to the International Arbitration League. He was knighted in 1907.

CREMIEUX, krâ-myú', Adolphe (real name ISAAC MOÏSE CRÉMIEUX), French lawyer and politician: b. Nîmes, France, April 30, 1796; d. Paris, Feb. 10, 1880. He practiced law in Nîmes and, from 1830, in Paris. Elected to the Chamber of Deputies in 1842, he served until 1848, when he became minister of justice in the provisional government set up after the overthrow of Louis Philippe. Re-elected a deputy in 1849, he was

among those imprisoned after Louis Napoleon's coup d'état in 1851. After his release he confined his activities to the practice of law until 1869, when he again became a deputy. As minister of justice in 1870-1871, Crémieux was responsible for a decree enfranchising the Jews of Algeria, and for the abolition of the death penalty for political offenders. In 1875 he was appointed senator for life.

CREMONA, krâ-mō'nâ, Luigi, Italian mathematician: b. Pavia, Italy, Dec. 1, 1830; d. Rome, June 10, 1903. Educated at the University of Pavia, he became professor of higher geometry at the University of Bologna in 1860. He taught in Milan from 1866 to 1873, when he went to Rome, where he became director of the engineering college. He served as a senator from 1879 and was minister of education in 1898. He is best known for his work in graphical statics and projective geometry. His works include *Introduzione ad una teoria geometrica delle curve piane* (1862) and *Elementi di calcolo grafico* (1879).

CREMONA, krê-mō'nâ (Ital. krâ-mō'na), the name of a province and a commune in Italy.

(1) The province, situated in Lombardy, has an area of 678 square miles; it includes a fertile plain which yields cereals, flax, and forage. Silk culture and the dairy industry are of special economic importance. Pop. (1951) 382,673.

(2) The commune, capital of the province, is situated on the left bank of the Po River, 49 miles east-southeast of Milan. It is an active agricultural center, with meat and dairy industries. Two specialties, *torrone* (hard candy) and a sort of French mustard, are widely exported. Other products include silk textiles, hats, pottery, and firearms. A traditional occupation is the making of violins, for which the city has been famous for centuries: its celebrated school of violin makers, which included the Amati, Stradivari, and Guarneri families, attained its highest development from the 16th to the 18th centuries, and the instruments made then are still the most highly valued in the world.

Cremona is also of unusual architectural interest. The main square is surrounded by beautiful medieval buildings, including the cathedral, begun in the 12th century, with an impressive marble façade and rose window and a richly ornamented interior; the Torrazzo, or clock tower, 360 feet high, built about 1250-1284; the octagonal baptistery, erected in 1167, one of the finest of its kind; and the Palazzo Comunale and the Loggia dei Militi, both of the 13th century. There are also several other fine churches and palaces. The Renaissance Church of San Sigismondo has an imposing cupola, and the Church of Santa Margherita contains frescoes by Giulio Campi, founder of the local school of painting which flourished in the 16th century. Many of the school's works are in the municipal museum. There are various schools, a fine library, and a large theater.

History.—Cremona was founded by the Romans in 218 B.C. as a colony, and was fortified to withstand the Carthaginian invasion and as a base for the conquest of Cisalpine Gaul; it was plundered and burned in 69 A.D., but was later rebuilt. In 602 it was taken by the Lombards; soon the local bishops gained privileges and extended their influence over the surrounding

countryside. The commune, formed in the 11th century, included nearby Crema, which soon rebelled with Milan's aid. Cremona sided with the imperial cities, and suffered from fierce internal struggles between Guelphs and Ghibellines until in 1344 it fell to the Visconti of Milan. Thereafter it followed Milan's fortunes, and in the wars between France and Spain for the domination of Lombardy it changed hands several times. Pop. (1951) 69,100.

CREODONTA, krē-ō-dōn'ta, an extinct suborder of the Carnivora (q.v.), distinguished by many primitive characters, and especially by the fact that the scaphoid and lunar bones of the wrist are separate instead of united into a single bone as in modern Carnivora. In all modern land carnivores the last premolar tooth in the upper jaw and first true molar in the lower jaw are enlarged and peculiarly adapted to cutting flesh (hence called "carnassials"), working against each other like a pair of shears. This is also the case with one group of the Creodonta, from which the modern Carnivora are descended. But in most creodonts there is no specialized carnassial, or it is developed from other teeth; these groups evolved on lines similar to the true Carnivora, but have left no descendants. One group, the arctocyonids, resembled the bears, with omnivorous teeth, plantigrade feet, and large compressed claws. Another group (*Mesonyx*, *Pachyaena*, etc.) resembled rather the hyenas, with large strong teeth fitted for bone crushing and digitigrade feet. Others had the teeth more especially adapted to cutting flesh, the first upper and second lower molar being developed into carnassials in *Oxyacna* and *Patriofelis*, the second upper and third lower molar in *Hyacnodon*. Besides these larger forms, from the size of a polar bear to that of a prairie wolf, there was a great variety of smaller creodonts, some more or less transitional to the primates, others to the insectivores. The early creodonts appear to represent most nearly the central stock from which most, if not all, of the modern mammals are descended (see CONDYLARTHRA). Creodonts were the dominant Carnivora of the Eocene epoch, and a few survived into the Oligocene, when their place was taken by the true Carnivora of more modern type. The evolution in the creodonts and true carnivores of carnassials of remarkably similar form, out of different pairs of teeth originally much less alike, is an excellent instance of "convergence" in evolution.

CREOLE, krē'ōl, a person born in America or the West Indies Islands, of pure European blood; as a Spanish creole. The term is sometimes applied, but wrongly, to any person born within tropical latitudes, of whatsoever color. In South and Central America the creoles enjoy high social privileges, and a creole nobility long existed in Venezuela. They are sallow, finely formed, and dark-eyed. Creole dialects are an interesting example of broken-down grammar. By English writers creole has sometimes been used to mean a mestizo or mulatto; but it cannot properly be applied to any person of mixed race, non-Latin stock or of European birth.

Consult Thomas, *Theory and Practice of Creole Grammar* (1869).

CREOLE CASE, 1841-1842, one of the landmarks of the antislavery struggle. On Oct. 27,

1841 the brig *Creole* sailed from Hampton Roads to New Orleans with 130 slaves; on November 17, 17 of them rose and overpowered the crew, killed one of the owners, and ran the vessel into the English port of Nassau. The authorities, as they were wont, imprisoned those directly charged with mutiny and murder, and let the rest go. Webster, then secretary of state, demanded from England the surrender of the whole, as being legal property of a state under the Constitution, on a legal voyage (Coastwise Slave-Trade Act of March 2, 1807), and covered by the United States flag on the high seas. This was exactly Calhoun's theory. The English government refused, but a new extradition treaty was agreed on (Aug. 9, 1842). In the House, March 21, 1842, Joshua R. Giddings presented a set of resolutions which formulated the position of the political antisavery party. The resolutions declared that the states have exclusive jurisdiction over slavery in their own territory; that the federal government has exclusive jurisdiction over the high seas, that slavery, as an abridgment of the natural rights of man, can exist only by edict of a municipality and within its power of enforcement (this was Judge Curtis's argument in the *Dred Scott* case); that a vessel on the high seas has passed from municipal to national jurisdiction, so that Virginia law ceased to apply to the *Creole* when it left Virginia territory; that the Negroes in resuming their natural rights violated no federal law, and *ex hypothesi* no state law; and that attempts to re-enslave them were violations of the Constitution and laws, the rights of the free states and national honor. The resolutions roused a storm. John Minor Botts (q.v.) of Virginia moved a counter resolution that no good citizen, and especially no national representative, should provoke contention over a question on which diplomatic negotiations were pending, and which might plunge the whole civilized world into war; and that Giddings' resolutions justified mutiny and murder. He asked a suspension of the rules to give his resolution precedence of Giddings', whose colleague moved the previous question; and after a two days' wrangle on points of order the resolution was passed without debate, 125 to 69. Giddings at once resigned; his constituency immediately re-elected him by an overwhelming majority, and instructed him to push his resolutions to a vote. As this would embarrass the Democratic Party—the first two clauses being their pet tenets, and the others only obvious inferences from them—they evaded it by abolishing "resolution day" for the rest of the session, devoting the day to other business when it came around. Giddings' resolutions expressed the legal basis of one phase of the antislavery agitation. The controversy with England over the case dragged on for more than a decade. It was finally settled in 1853 when an Anglo-American commission awarded an indemnity of \$110,330 to the United States.

Consult Giddings, J. R., *History of the Rebellion* (New York 1861).

CREOLE STATE, Louisiana, where the direct descendants of the original French and Spanish colonists form an important element in the social fabric.

CREOLIN, a mixture of cresols and creosols and other allied substances derived from

the destructive distillation of wood, once used very widely in watery emulsion as an antiseptic.

CREON, krě'ōn, the name of two rulers in Greek legend: (1) a Corinthian king, who plays a minor part in the myth of Jason and Medea (qq.v.); (2) a Theban king, brother of Jocasta, the wife of Laius and mother of Oedipus. After Oedipus had unwittingly slain his father, King Laius, Creon ruled Thebes and offered Jocasta and the crown to whoever would free the city from the Sphinx. Oedipus slew the monster, married Jocasta (not knowing she was his mother), and became king. After the deaths of Eteocles and Polynices (q.v.), Oedipus' sons and successors, Creon resumed the throne. See also **ANTI-GONE**; **OEDIPUS REX**.

CREOSOTE, krě'ō-sōt, a term derived from two Greek words meaning "meat" and "to preserve," is applied to products of both wood tar and coal tar. By far the larger amount of all creosote is derived from coal tar. Wood creosote, or creosote from wood tar, is commercially a medicinal whose major components are the phenolic derivatives guaiacol and cresol. It is described as a colorless or slightly yellow oil, highly refractive, with a characteristic smoky odor, and a caustic, burning taste. Materials of this nature are present in smoke from hardwoods, and thus serve to preserve meat and to impart desired flavors at the same time.

Creosote from coal tar is more accurately called creosote oil and comprises materials boiling above 235°C. The second fraction from coal tar distillation is carbolic oil, often called insecticide oil. Removal of insecticide oil from creosote oil is rarely complete. Distillation of tar is continued until a pitch with the desired melting point is reached; this pitch is used as road and roofing tar. Distillation of creosote usually ends between 400°C. and 450°C. The commercial product, whose chief use is that of wood preservation, contains over 160 identifiable chemical compounds, mainly aromatic hydrocarbons with smaller quantities of phenolic and nitrogen bases. Some 25 to 30 compounds account for over one half the composition of commercial creosote.

Creosote is made to penetrate deeply into railroad ties, telephone poles, and marine piling by placing the material to be treated in giant closed vessels, from which air and moisture are removed, and into which creosote is admitted under heavy pressure and at high temperatures. Tests show that creosote-treated wood remains sound and serviceable even after exposure to very severe conditions for 30 years or longer.

W. T. READ.

CRERAR, krě'rär, **Henry Duncan Graham**, Canadian soldier: b. Hamilton, Ontario, Canada, April 28, 1888. He was educated at Upper Canada College, Toronto, the Royal Military College, Kingston, the Royal Staff College, Camberley, England, and the Imperial Defense College, London. He served in World War I, rising to the rank of staff officer in the Canadian Corps in 1918, and became general staff officer at the War Office in 1925. In 1940-1941, during World War II, he was major general and chief of the Canadian general staff; in 1944 he was made general, and in 1944-1945 commanded the 1st Canadian Army. He retired in 1946, but in 1947

headed a Canadian mission to Japan and in 1948 was the first Canadian to be appointed aide-de-camp to the king.

CRERAR, **John**, American financier and philanthropist: b. New York, N. Y., March 8, 1827; d. Chicago, Ill., Oct. 19, 1889. He accumulated a fortune in the manufacture of railroad supplies, became a director of several railroads, and was one of the incorporators of the Pullman Palace Car Company. He left \$2,500,000 to found the John Crerar Library in Chicago, stipulating that it should exclude "all skeptical trash and works of questionable moral tone." His will also provided \$100,000 for a statue of Lincoln by Augustus Saint-Gaudens in Lincoln Park, Chicago, and \$1,000,000 for charitable and religious organizations.

CRERAR, **Thomas Alexander**, Canadian statesman: b. Molesworth, Ontario, Canada, June 17, 1876. He was educated at Portage la Prairie, helped on his father's farm until the age of 19, and then taught school for five years; later he attended Manitoba College and farmed for several years. He organized the Grain-Growers' Grain Company (later United Grain Growers, l.t.d.) formed to give farmers better selling facilities on the Winnipeg exchange, and was its president, 1907-1929. He was minister of agriculture under Sir Robert Borden, 1917-1919, directing food production and control during World War I. He was leader of the National Progressive Party, 1921-1922; minister of railways and canals, 1929-1930; and minister of mines and resources, 1935-1945, when he became a senator.

CRES, tsrěs (Ital. **CHERSO**, kěr'sō), island, part of Croatia, Yugoslavia, located at the head of the Adriatic Sea, northwest of Croatia. It is about 40 miles long, with an area of 158 square miles. Its leading occupations are sheep raising, agriculture, and fishing. It passed from Austria to Italy in 1919 and to Yugoslavia in 1947. Pop. of Cres district (1948) 3,393.

CRESAP, krě'săp, **Michael**, American trader and Indian fighter: b. Allegany County, Md., June 29, 1742; d. New York, N. Y., Oct. 18, 1775. The son of a Yorkshireman who had settled in western Maryland, Cresap married while yet a minor, became a merchant, and established a settlement on the Ohio River below Wheeling, W. Va. In the spring of 1774 he defeated a party of Indians in a skirmish sometimes called Cresap's War which precipitated Lord Dunmore's War (see **COLONIAL WARS IN AMERICA**). A party of whites had treacherously massacred the family of Chief Tah-gah-jute, or Logan (q.v.) on Yellow Creek, and Cresap, as leader of the white men in that region, was accused of the crime. Reference to the episode in Thomas Jefferson's *Notes on the State of Virginia*, published in 1782, served to attach Cresap's name to the deed, until his son-in-law, Luther Martin, and later Brantz Mayer, showed that he had been in Maryland at the time of the occurrence. The facts have never been made entirely clear. In August 1775, Cresap went with a company of men to Boston and joined Washington's army, but became ill before he took command and died on the way home.

For details consult Jacob, J. J., *A Biographical Sketch of the Life of the Late Capt.*

Michael Cresap (Cumberland, Md., 1826; new ed., with notes, by Brantz Mayer, Cincinnati 1866), and Mayer, Brantz, *Tagah-jute*, or *Logan the Indian and Captain Cresap* (New York 1867).

CRESCENDO, krě-shě'n'dō, a musical term signifying that the notes of the passage over which it is placed are to be performed with constantly increasing volume of tone. The ancient Romans, as we learn from a passage in Cicero, were aware of its beauty, and practiced it continually. Crescendo passages are usually indicated by the abbreviation *cresc.* or the mark < signifying piano to forte and fortissimo; the corresponding mark > diminuendo, marking the transition from forte to piano.

CRESCENT, krěs'ěnt (Lat. *crescens*, growing), an emblem representing the moon in her state of increase. The Egyptians and the Greeks decorated their moon goddesses, Isis and Io, with the crescent, which announced the returning light of the moon. Athenian citizens of illustrious birth wore crescents of ivory and silver upon their buskins; and the same mark of distinction was granted to the patricians and senators of Rome. It was used by the Romans as an emblem of the eternity of empire. Hence it was found on medals of many cities, particularly of Byzantium, as capital of the Eastern Empire, whence it is supposed to have been borrowed by the Ottomans. Since their establishment in Europe it has been the universal emblem of their empire. It is frequently seen on churches in Russia, generally surmounted by the cross, indicating the Byzantine origin of the Russian Orthodox Church. During the Crusades, particularly, the crescent was the distinguishing symbol of the Moslems, as the cross was representative of the Christians.

The word is also applied to a Turkish musical instrument introduced into the German military bands at the time of the Turkish wars and now in general use in military bands. It consists of a staff surmounted by a cap and supporting several crescent-shaped brass plates on each of which little bells are hung. The instrument is played by being jingled in time to the music.

In heraldry, the crescent is used both as a bearing or charge; and as a difference or mark of cadency. In the latter cases, it designates the second son and those that are descended from him.

CRESCENTIA. See CALABASH-TREE.

CRESCENTINI, krā-shān-tě'ně, **Girolamo**, Italian singer: b. Urbino, Feb. 2, 1766; d. Naples, April 24, 1846. He was styled the Italian Orpheus, because of his exquisite mezzo-soprano. After studying with Gibelli at Bologna, he made his debut at Rome in 1783, and then toured through the principal cities of France, England, and Italy. Napoleon awarded him the Iron Crown in 1805, and was his patron (1806-1812). Leaving Rome in 1816, he became a professor of voice culture at Naples. His treatise on vocalization was published in both French and Italian.

CRESCENTIUS, krě-sě'n'shī-ūs, **Johannes** or **John** (surnamed NOMENTANUS), Roman patriot; d. 998 A.D. One of a family of noble

Romans, he was a leader of the party in Rome opposed to the rule of the Holy Roman emperor in the 10th century. From 985 to 996 his rule in Rome was practically undisputed, and he was recognized as Patricius by the Byzantine empress.

In 996 Otto III came to Rome, and overthrew the rule of Crescentius temporarily, but the latter resumed his position when the emperor left the city, drove the pope, Gregory V, from Rome, and supported the antipope, John XVI. Otto, however, finally defeated Crescentius in 998 at the castle of Sant' Angelo and had him beheaded.

CRESCENZI, krā-shě'n'tsě, **Pietro**, or **PETRUS DE CRESCENTIIIS**, Italian writer on agriculture: b. Bologna c.1230; d. about 1310. At the age of 70 he was made senator, and he then carried into execution his principles of agriculture on an estate near Bologna, in the cultivation of which he passed the remainder of his life. He has left a work on agriculture entitled *Opus Ruralium Commodorum*, a remarkable monument of his time, of which it is far in advance. This work was written originally in Latin. There exists an Italian translation (1478), esteemed very highly on account of the purity of the language, which has given rise to the opinion that Crescenzi wrote in his native tongue. His principles are simple, founded upon experience and free from many prejudices which continued to prevail in Europe for centuries after. His work was translated into several European languages, particularly for Charles V of France, in a splendid manuscript (1373), still extant; and no sooner was the art of printing invented than copies of this work were greatly multiplied. The oldest known edition, now very rare, appeared at Augsburg in 1471. The genus *Crescentia* was named by Carolus Linnaeus in honor of the famous author, who was probably the first since the days of the Romans to point out the high value of agricultural science.

CRESCIMBENI, krā-shēm-bā'ně, **Giovanni Maria**, Italian scholar and poet: b. Macerata, Oct. 9, 1663; d. Rome, March 8, 1728. He was one of the 14 poets associated with Christine of Sweden in founding the Academy of Arcadians in Rome, of which he was the first president (1690-1728). In 1698 appeared his *Istoria della volgar poesia*, a work of vast industry, but destitute of method and criticism. He next published his *La bellezza della volgar poesia* (1700), which passed in a short time through three editions, and like the earlier work was first made capable of being understood and enjoyed by the *Comentarij intorno alla storia della volgar poesia* (1702-1711).

CRESCO, krěs'kō, city, Iowa, and Howard County seat; altitude 1,300 feet, 18 miles west-northwest of Decorah, and served by the Chicago, Milwaukee, St. Paul and Pacific Railroad. It is a shipping point for livestock, eggs, butter, and poultry. There are two large creameries, bottling works, and manufactures of wooden products and barn cupolas. New varieties of popcorn have been developed nearby. A few miles away is Niagara Cavern with a 60-foot waterfall. The city is governed by a mayor and council and owns its waterworks. Pop. (1950) 3,638.

CRESOL, krě'söl, an aromatic hydrocarbon (q.v.) having the formula $\text{CH}_3\text{C}_6\text{H}_4\text{OH}$, which may be regarded as derived from phenol by the substitution of methyl (CH_3) for one of the hydrogen atoms in the benzene nucleus. Like all disubstitution benzene compounds, cresol exists in three isomeric modifications, known respectively as orthocresol, metacresol, and paracresol. All three occur in coal tar, though the ortho- and para-compounds are present in much larger quantity than the meta-compounds. The ortho- and meta-compounds readily yield nitro-derivatives, and are used in the manufacture of disinfectant, insecticide, photo developer, explosives, and paint remover.

Orthocresol melts at 30.4°C . and boils at 370°C .; metacresol melts at 10.9°C . and boils at 202°C .; and paracresol melts at 36°C . and boils at 202°C .

CRESPI, kräs'pě, **Giuseppe Maria**, Italian painter, known as LO SPAGNUOLO: b. Bologna March 16, 1665; d. there, July 16, 1747. He particularly resembles Rembrandt in his depiction of light and shade. His most famous picture is *The Massacre of the Innocents*. He painted for Cardinal Ottoboni *The Seven Sacraments*, now in the Dresden gallery. When his patron, Cardinal Prospero Lambertini, became Pope Benedict XIV, he conferred the honor of knighthood on him.

CRESPI, kräs'pě, **Juan**, Spanish missionary and explorer: b. Spain 1721; d. Carmel Mission, Calif., Jan. 1, 1782. A pupil and close friend of Junipero Serra, he came to America in 1749 and became a member of the Franciscan College of San Fernando, Mexico. With the expulsion of the Jesuits from Lower California in 1767, he was put in charge of a mission there, and two years later he was one of the first of a band of explorers and missionaries to claim San Diego for Spain. He pushed further north with Gaspar de Portolá and was one of the discoverers of San Francisco Bay. He returned to San Diego and became one of the founders of the Carmel Mission there, returning to San Francisco Bay in 1772 to explore the route around it. In 1774 he was one of a band to make a sea voyage to Alaska and back. An extensively traveled and learned man, his diaries were translated and edited by Herbert E. Bolton in *Juan Crespi, Missionary Explorer on the Pacific Coast, 1769-1774* (Berkeley, Calif. 1927).

CRESS, krěs, various plants of the family Cruciferae. The cultivated ones are all used as salads, for which their pungent foliage especially recommends them. The common or garden cress or peppergrass (*Lepidium sativum*) is generally found in gardens as a spring annual. The seeds may be sown as soon as the soil can be worked and the fresh herbage cut for use in about three weeks. Successive sowings should be made every three or four days. The plant resembles watercress in flavor, and makes an excellent garnish. Virginia cress (*L. virginicum*) is a similar species and has been grown and used like the preceding. Winter or upland cress (*Barbarea vulgaris*) is an annual, common in fields in Europe and America and sometimes cultivated for winter use, as is also its close relative (*B. bracteata*) which is called early winter or Bell Isle cress. Watercress (*Radic-*

ula nasturtium-aquaticum) is a perennial aquatic herb common in cool brooks and yielding an important winter salad where the streams do not freeze. Though it does best in gravelly bottomed shallow streams, it may be cultivated in any moist ground, or under greenhouse benches if well supplied with water. Indian cress, which is a species of *Tropaeolum*, is commonly known as nasturtium, a popular garden flower whose foliage, flower buds, and blossoms are used in England as salads, and its immature fruits as a substitute for capers.

CRESSET, krěs'ět. (1) A bowl-shaped article made of incombustible material, used to contain a light, and hung from above or suspended on a pole or placed as beacon on a watch tower or other prominent place. The cresset light was formerly the flame from a coil of pitched rope, but in more modern times oil and wick were used. The large lantern of ancient days when suspended from the end of a long pole and carried on a man's shoulder was called a cresset. A stone containing bowl-shaped hollows which are sometimes used as cressets is called a cresset stone. (2) An iron fire cage placed inside casks to make them bulge, used by coopers, who made barrels by hand.

CRESSIDA, krěs'i-dā, in Greek legend a daughter of Calchas, the Trojan priest, whose fame rests upon the story of her amour with Troilus, a valiant Trojan warrior, and her eventual deserting of him for Diomedes, a Greek soldier. The original story of Troilus and Cressida started as far back as Homer, who knew her as Briseis, and culminates in the epic poem, *Troilus and Criseyde* (q.v.), by Geoffrey Chaucer. Other interpreters of the romance were Dictys Cretensis, Giovanni Boccaccio, and Guido delle Colonne.

CRESSOL. See CRESOL.

CRESSON, krěs'n, **Elliott**, American philanthropist: b. Philadelphia, March 2, 1796; d. Feb. 20, 1854. He was a prosperous merchant in Philadelphia, where he resided all his life, and a member of the Society of Friends. He helped to buy land for the first African colony of liberated slaves in the territory of Bassa Cove, Liberia, and was an active leader of the American Colonization Society. He recommended his measures with the eloquence of sincere conviction, and met with much favor and success. He sailed to England in 1840 where he spent some years in advocating the project of colonization. His time and labor were contributed without pay, and by his will he distributed his estate to a great variety of charities.

CRESSON, borough, Pennsylvania, in Cambria County, at an altitude of 2,022 feet, 12 miles west of Altoona, on the Pennsylvania Railroad. It is a summer resort situated in the Allegheny Mountains and is noted for its scenery and magnesia springs. It has large railroad shops and is a shipping point for coal mined in the vicinity. Mt. Aloysius Junior College and the state tuberculosis sanatorium are located here. Pop. (1950) 2,569.

CREST, krěst (Lat. *crista*, plume or comb), the rising on the defensive armor of the head,

also the ornament frequently affixed to the helmet, such as a plume or tuft of feathers or a bunch of horsehair. Warriors have always been in the habit of adorning their persons, and the helmet, from its conspicuousness, was very naturally chosen as the place of one of the principal ornaments. The crests of the earlier Greeks were of horsehair; afterward plumes, especially red ones, were adopted.

In the Middle Ages, when rank and honors became hereditary, and particular heraldic devices were appropriated to particular families, the crest became a distinguishing hereditary mark of honor. It is denoted in heraldry by a figure placed upon a wreath, coronet, or cap of maintenance, above both helmet and shield; as for instance, the crest of a bishop is a miter. The crest is considered a greater criterion of nobility than the armor generally. It is commonly a piece of the arms, rests on a wreath of the principal metal and color of the coat of arms, color and metal alternating, or on a cap of maintenance.

CRESTING, in architecture, is an ornamental finishing in stone, tiles, or metal in the wall or ridge of a building, such as the cresting at Exeter Cathedral, where the ridge is ornamented with a small range of leaden fleurs-de-lis

CRESTON, krēs'tūn, city, Iowa, Union County seat, at an altitude of 1,312 feet, 57 miles southwest of Des Moines, and served by the Chicago, Burlington and Quincy Railroad. It was named for its location on the crest of the ridge between the basins of the Mississippi and the Missouri rivers. The city is the shipping and trading center of Iowa's bluegrass region, which raises corn, oats, hay, potatoes, hogs, and cattle. It was laid out in 1869 for the shops of the new Chicago, Burlington and Quincy Railroad and as divisional headquarters. There are railroad shops and yards, stockyards, creameries, bottling works, and flour mills. The city's water supply is drawn from two large reservoir lakes. Creston was incorporated in 1871 and chartered in 1881. The municipal government is by a mayor and council. Pop. (1950) 9,317.

CRESWICK, krēz'ik, Thomas, English landscape painter: b. Sheffield, Feb. 4, 1811; d. Bayswater, Dec. 28, 1869. He studied drawing at Birmingham under John Vincent Barber and early showed artistic talent. His first pictures were admitted into the Royal Academy exhibition when he was only in his 17th year, and his success was afterward continuous. He was elected an associate of the Academy in 1842 and an academician in 1851. Among his better known works are *England* and *The London Road a Hundred Years Ago*. Tending particularly toward depicting English rivers, Creswick's landscapes are pleasing and attractive, and display much delicate and finished detail. He was a well-known book illustrator and was also known as an etcher. His works were collected for the London International Exhibition of 1873 and a catalogue compiled by T. O. Barlow.

CRETACEOUS, krē-tā'shūs, a name applied by geologists to the latest period of the Mesozoic era, and to the system of rocks then formed. It follows the Jurassic and precedes the Tertiary. The name comes from the Latin for chalk and in the type localities the formation is

usually characterized by white, soft chalk, but sometimes, more especially in Italy and the south of France, this chalk is replaced by compact solid limestones. In England and France the Cretaceous rocks consist chiefly of carbonate of lime, but usually abound with silica in the shape of nodules, plates, and veins, and with iron pyrites in nodules and radiated cylinders. The organic remains in the chalk are, with few exceptions, eminently marine, and from the fine texture of the substance in which they have been embedded are usually well preserved. They embrace seaweeds, sponges, corals, echinoderms, mollusks, crustacea, fishes, and reptiles. Deep-sea dredgings in the Atlantic have revealed the fact that a fine, white organic ooze, resembling the chalk, is still in process of formation in the oceanic abysses at the present day. In America, the system is divided into Lower Cretaceous or Comanchean, and Upper Cretaceous. Some writers give Comanchean the rank of a period, making it coordinate with Jurassic, and restrict the term Cretaceous to the Upper Cretaceous as above defined. During Lower Cretaceous the continent of North America was not very different in outline from now, except that the Gulf of Mexico was expanded, and that the Pacific still covered the site of much of the present Coast Ranges. During Upper Cretaceous time, a great arm of the sea encroached on the land, finally extending from the Gulf of Mexico to the Arctic. In this a great thickness of marine sediments was laid down. At the same time much of the Atlantic and Gulf coastal plain was under water. Toward the close of the period (Laramie epoch) the interior sea again retreated, leaving a large area of low swamp, in which much coal was formed. The period, and the Mesozoic era as well, were brought to a close by folding which produced the Rocky Mountains. The Andes were probably folded at the same time.

Life of the Cretaceous.—The great groups of reptiles which developed during Triassic and Jurassic reached their climax in Cretaceous, and dinosaurs, pterosaurs, mosasaurs, ichthyosaurs, and plesiosaurs all became extinct at the close. The ammonite cephalopods also died out completely. The most notable addition was the development of the modern types of flowering plants, which became dominant before the close of the period.

CRETE, krēt, or **CANDIA** (ancient name Creta; Turkish name KIRID), one of the most important islands belonging to Greece, and the 4th largest island in the Mediterranean, 60 miles from the Peloponnesus and 160 miles from the African coast; it is 160 miles long, 6 to 35 broad, and contains 3,199 square miles. A high chain of mountains covered with forests runs through the entire length of the island, in two ranges. On the northern side it declines moderately to a fertile coast, provided with good harbors; on the south side, steeply to a rocky shore, with a few roadsteads, and reaches its greatest height in the lofty Psiloriti (the ancient Ida), 8,195 feet high, and always covered with snow. Numerous springs give fertility to most of the valleys, in which, and on the declivities of the mountains, is seen a luxurious vegetation. The air is mild; the summer is cooled by the north winds, the winter is distinguished only by showers of rain. Earthquakes, however, are not infrequent. Agriculture is at a very low stage, and education

and the amenities of civilized life are lacking. Olive production is the principal source of wealth. Other products are wheat, oranges, lemons, silk, grapes, wine, valonia, carobs and honey. Silk production has declined. Crete is believed to be rich in minerals (iron, lead, manganese, lignite, sulphur, copper and zinc are found). The inhabitants (estimated at 1,200,000 in ancient times or 900,000 in the time of the Venetians), are now about 386,000. Moslems have mostly emigrated. The capital is Canea. Pop. 26,604. The chief city and center of trade is Candia. Pop. 33,404.

Greek mythology made Crete the scene of many of the adventures of the gods and heroes. Here Saturn is said to have reigned and afterward Minos.

Archæological exploration and excavation in modern times have revealed that a Neolithic period of evolution from about 10,000 to 3315 B.C. was followed by the Minoan or Ægean period of civilization, which existed contemporaneously with the first dynasty of Egypt, from 3315 to 1450 B.C., and reached its culminating point in Crete. Minoan towns and palaces have been uncovered in different parts of the island, which recall the skill attributed to Dædalus (q.v.). They exhibit architecture and engineering of a high order, unsurpassed for domestic conveniences in modern times. At Cnossus in the ruined palace of Minos (q.v., whence Minoan), the thalassocratic king of the eastern Mediterranean, in the Hagia Triada and its shrine near Phæstus, in the palace at Phæstus, in the uncovered ruined towns at Palaikastro, Gourni and Zakro, in the shrine and Dictæan cavern, the legendary birthplace of the Cretan Zeus, near Psychro, and in the ruins on the neighboring islets of Pseira and Mochlos, the finds include archives of clay tablets in great quantities inscribed with the early forms of Minoan pictographic and linear script, polychrome decorated pottery, lifelike ivory and clay figures, mural paintings revealing the customs of the period, enormous decorated storehouse jars, stone and bronze votive figures and objects of cult, sarcophagi, etc. While at Cnossus, also, have been uncarthed the foundations of what are acknowledged to be the traditional labyrinthine prison of the Minotaur (q.v.) or bull of Minos, the incestuous monster for whose gratification Athens was compelled to send an annual tribute of seven noble maidens and seven boys until Theseus (q.v.) killed the beast, probably during an invasion of the island which consummated the catastrophe that overwhelmed this early Cretan culture.

The island figures little in Greek history, and took no part in the wars with the Persians. It possessed a number of independent towns often at war with each other, but ready to combine against a stranger. Crete was conquered by the Romans 67 B.C. In the year 823 it passed from the Roman emperors of the East to the Saracens, who built the capital, Candia, on the ruins of Heraclea, but were expelled again in 961 by the Greeks. The Byzantine sovereign sold the island to the Venetians in 1204, who fortified most of the cities, won the good will of their new subjects by a mild government, and repelled all the assaults of the Genoese and Turks till the middle of the 17th century. About this time the attacks of the Turks became more

determined. They landed a large force in 1645, which soon took Canea and Retimo, and besieged the capital with vigor. The siege, the longest in modern history, lasted over 20 years. To assist the Venetians volunteers from all parts of Europe poured in. The Christians, after having exhausted all means of defense, were compelled to surrender to the Turks Sept. 27, 1669. At the time of the capitulation the garrison consisted of only 2,500 soldiers; 30,985 Christians and 118,754 Turks were killed or wounded during the siege. Having obtained possession of the capital, the Turks now endeavored to expel the Venetians from the strongholds which remained to them on the island and before the expiration of the 17th century they had been successful in their efforts.

Three pashas, at Candia, Canea and Retimo, now governed the island. On account of the feuds of these pashas the inhabitants of the western mountains succeeded in forming a government of their own, under Turkish protection. As the compacts made with them by the Turks were not always observed, they were wont in such cases to take up arms, and though they were often defeated they were never entirely subdued. The pashas having demanded hostages of them in 1821, they joined the Greek insurgents.

Had the mountaineers been armed when the Turks made their first descent on the island, it would probably have been impossible for the invaders to have maintained themselves in Candia, but as it was the island remained under Turkish rule. In 1868 a formidable insurrection, fomented by Greece, was with difficulty suppressed by the Turks, after a tedious conflict. In consequence of this revolt the Turks granted to the Cretans a certain degree of autonomy, but Turkish bad faith produced another revolt nine years later. At that time a new constitution of a parliamentary character was inaugurated, but many of its provisions were annulled in 1889. In 1896 there was again a rising against the Turks, in which, as before, the Greeks took part, one result being the outbreak of war between Greece and Turkey. The Greek troops landed on the island were withdrawn at the instance of the Great Powers, who undertook to secure an autonomous government under Turkish suzerainty and to cause the Turkish troops to be withdrawn. On Sept. 6, 1898 the Mohammedans of Candia rose against the Christians, and the fighting resulted in the death of many of the latter, including some British sailors. The leading powers at once demanded the complete withdrawal of the Turkish troops who had abetted the rebels, and ultimately, on October 11, the Sultan complied with their demand, the troops being soon after withdrawn. Shortly afterward Prince George of Greece was appointed high commissioner or governor of the island. A national assembly met and formed a constitution providing for the creation of a legislature and guaranteeing freedom of religion to all inhabitants. Although order was restored, popular sentiment continued to be increasingly in favor of annexation to Greece, and in 1904 the High Commissioner attempted to gain the consent of the Powers to such a step but without success. There were revolts against the high commissioner's arbitrary policy in 1904 and 1905; in the latter year a revolutionary assembly proclaimed the union

CRETE



The "Pass of the Thirty Windmills" on the island of Crete.

Three Lions

CRETE



A mountain village near Candia.



Suda Bay.

British Combine

of the island with Greece, and this was followed by a similar proclamation on the part of the regular Chamber. The powers intervened, and after some desultory fighting the insurgents laid down their arms in November 1905. In 1906 Prince George resigned the high commissioner-ship of Crete. The overwhelming majority of Greeks in the Cretan Assembly persisted in treating their island as an integral part of the Greek kingdom, while the government at Athens was obliged to respect Crete as a shadowy vassal of Turkey. It was a Cretan leader, Eleutherios Venizelos, who in 1910 became premier of Greece and organized the Balkan League that prepared to wage war against Turkey. A popular uprising in March 1912 put an end to the government that had been forced upon the island by the protecting powers, and erected in its stead a provisional government, the reception of whose delegates at Athens in October 1912 was one of the excuses for the outbreak of the Balkan War. By the Treaty of London (May 31, 1913) Turkey renounced all sovereignty over the island. The union of Crete with Greece was formally recognized by the other Balkan states by the Treaty of Bucharest (Aug. 10, 1913). In 1941 when Britain decided to send part of her army of the Nile to the aid of the Greeks, one of her first moves was to occupy and fortify Crete. When the Greeks and British fell back before the German onslaught in April, the Greek king, part of his army and certain British divisions went to Crete and there prepared to make a stand against the Nazi forces. The attack came on May 20, 1941, when the German transport planes and gliders began dropping German soldiers from the air. In two days it was estimated that about 11,500 Germans had been ferried by air to Crete. The Germans occupied Candia and Retimo and Meleme airport but were driven out from the former two. German troops continued to arrive by air and the fiercest fighting of the war took place between May 24 and June 1. On the last day of May and June 1 the British evacuated 15,000 troops to Egypt. Their losses were placed at 13,000. Crete was occupied by Germany on June 2. German positions on the island were bombed by the Allies a number of times in 1943, and the air attacks were intensified in 1944. Allied forces landed in October 1944, and the invaders retired to the western end of the island. A tacit truce lasted until the armistice of May 8, 1945; but the surrender of 10,500 Germans to 500 British troops was not completed until May 26, in order to protect the invaders from massacre by the civilians.

Recovery after World War II depended largely upon the revival of exports. The island, which voted 70 per cent against the monarchy in the Greek plebiscite of 1946, suffered under frequent clashes between rightist government forces and guerrillas in 1947. In 1948 a group of American experts from the Rockefeller Foundation were engaged in a survey of the island to aid in the development of a public health program and to enable more efficient utilization of natural resources. In July of 1949 the United States Sixth Task Fleet in the Mediterranean held amphibious maneuvers on Crete.

Consult Höck, *Creta* (1823-29); Pashley, R., *Travels in Crete*, 2 vols. (Cambridge 1837); Spratt, T. A. B., *Travels and Researches in Crete*, 2 vols. (London 1865); Stillman, W. J., *The Cretan Insurrection of 1866-68* (New York 1874); Freese, J. H., *Short Popular History of Crete* (London 1897); Evans, A. J., *The Palace of Minos*

at Knossos, 4 vols. (New York 1921-35); Eliadi, M. N., *Crete. Past and Present* (London 1933); Pendlebury, J. D. S., *Archaeology of Crete* (London 1939).

CRETE, city, Nebraska, in Saline County; altitude 1,359 feet; on the Big Blue River; 19 miles southwest of Lincoln; on the Burlington and Quincy and the Missouri Pacific railroads; with a municipal airport, and good modern highways. In the midst of a grain-growing region, it makes flour and beer, and handles dairy products. Chemurgic equipment is manufactured here. Crete is the seat of Doane College (co-educational), and has a Carnegie library. First settled in 1865, Crete was incorporated as a village in 1871, and as a city in 1872. In 1886 its charter was revised. The government is administered by a mayor and council. The water power and lighting systems are all city-owned. Pop. (1930) 2,865; (1940) 3,038; (1950) 3,682.

CRETIN, krā-tān', Joseph, American ecclesiastic: b. Montluel, Ain, France, Dec. 19, 1799; d. St Paul, Minn., Feb. 22, 1857. He was ordained a priest in 1838 and was assigned a charge in his own diocese. His great desire was to work in the foreign missions, and when the opportunity to go to America presented itself he at once accepted. He was somewhat disappointed when he found himself among civilized people in Iowa instead of among Indians. He was made vicar general of Dubuque, a position which he held until 1851, when he was appointed bishop for the new diocese of Saint Paul. He found only nine priests in the diocese, but new parishes were soon opened, schools established, the orphans and the sick received attention, and provisions were made for the Indian tribes, the Ojibways and the Winnebagoes. In three years he increased the number of churches from 1 to 29, and to these added 35 stations.

Consult Shea, J. D. G., *The Hierarchy of the Catholic Church in the United States* (New York 1886).

CRETINISM, krē'tin-iz'm, a condition defined as an endemic symptom complex of bodily and mental disturbance occurring in population centers where endemic goiter is prevalent, the important manifestations being largely in the skeleton, skin, and nervous system, in which retardation of growth and mental development play a leading role and which cannot be attributed to another congenital or acquired disease. It is a somewhat puzzling matter when one considers that while endemic goiter is common in the United States and Canada, although less so than it was a decade or two ago, endemic cretinism does not occur at all in North America although common in Europe and Asia. The conception of endemic cretinism is that of a thyroid deficiency depending on a local endemic factor. This concept has not been accepted everywhere due to its being regarded by many scientists as incomplete. In the United States, the generic term cretinism is referred to often as juvenile, or childhood myxedema. The disease is chronic and is due to a diminution in functional activity of the thyroid gland secretion, beginning before birth or in the early weeks of life, which results in physical and mental deficiencies. The fundamental etiologic factors are unknown but several varieties of the malady have been described. These are: (1) the athyreotic type in which there is congenital absence of the thyroid gland; (2) the nongoiterous type in which a small mal-

functioning or nonfunctioning gland is present; and (3) a goiterous type in which the thyroid is large but cystic, with little glandular structure present, and incapable of secreting sufficient thyroxin to maintain the body economy. The first of these is the variety seen usually in the Western Hemisphere, the others being encountered almost entirely in Europe and Asia.

The symptoms and physical signs of the disease are observed a few weeks after birth and not at once, since the mother provides the child with sufficient thyroxin while it is in the uterus. At about 6 weeks the skin becomes dry and wrinkled, the hair coarse, brittle, and lacking normal growth. The child's face is broad and full and the eyes appear abnormally far apart. The tongue becomes thickened, and the infant drools continually. As the child becomes older it is noted that growth is retarded, the arms and legs being short and stumpy. Dentition is delayed and the child appears dull and apathetic. In the matter of prognosis for recovery there is always doubt. Theoretically, if the existence of the disease is suspected fairly early, it might be expected that the administration of dried thyroid gland would cause immediate cessation of symptoms and resumption of normal growth. As a matter of fact, usually by the time treatment is begun it is too late to prevent some permanent mental deficiency. The disease most often confused with cretinism is Mongolian idiocy, the appearance of the individual being somewhat similar in the two diseases. A differential diagnosis can be made by the therapeutic test since Mongolian idiocy does not respond to the administration of thyroid. See also GOITER: MYXEDEMA; THYROID GLAND.

HAROLD W. JONES, M.D.

CRETONNE, krê-tôn', a thick, firm cotton cloth with various textures of surface, printed on one side or on both with pictorial and other patterns, and used for curtains and for upholstering. Unlike chintz, it is hardly ever glazed.

CREUSA, krê-û'sä, the name of several celebrated women of Greek antiquity. (1) Daughter of Erechtheus, who, before she was married to Xuthus, gave birth to Ion, the fruit of an amour with Apollo. To her second husband she bore Achaeus. (2) The wife of Jason and the daughter of King Creon (q.v.) of Corinth. She was burned to death with her father by the magical poisoned diadem and robe given her as bridal gifts by Medea (q.v.). (3) The daughter of Priam and Hecuba, wife of Aeneas and mother of Ascanius. In the tumult of the conflagration of Troy, when Aeneas fled with the images of his gods, with his father and son, he lost her, and after he had sought her for a long time in vain her spirit appeared to him, saying that the mother of the gods had taken her to herself because she was not willing that she should leave Phrygia.

Consult Virgil's *Aeneid* (book 2, pp. 730-794).

CREUSE, krüz, a department of central France with an area of 2,163 square miles. Its capital is Guéret (pop. 1946, 10,192). Formed from parts of the provinces of la Marche, Poitou, Bourbonnais, Limousin, and Berry, its name derives from the Creuse River which traverses it in a northwesterly direction. The department contains two arrondissements (Guéret, prefec-

ture; Aubusson, subprefecture), 25 cantons, and 266 communes. Geologically it is a part of the Massif Central. The climate is rather severe with heavy precipitation, especially of winter snow, on its arid plateaus. The winters are long and cold, spring is a short season, but autumns are long and pleasant, as in Auvergne. The swollen rivers of winter and spring diminish to shallow streams in summer. A poor agricultural region, only a quarter of the department is under cultivation. There are many small farms, the chief crops being rye, buckwheat, and especially potatoes. Chestnuts of exceptionally fine quality are a specialty; together with potatoes they are used to fatten swine. Sheep are raised on the upland heaths and Creuse is France's leading sheep-raising department. Creuse wool was used in fabricating Aubusson tapestries and today is in demand by the carpet and cloth manufactories of that ancient town.

Every spring there is a migration of between 30,000 and 35,000 of the inhabitants to Paris and cities of eastern France seeking employment as masons. These are the *Limousins* (the provincial name having become a synonym for mason). Most of them return home for the winter months. Pop. (1946) 188,669.

CREUSE, a river of central France, right affluent of the Vienne. It rises on the southern border of the Department of Creuse, flows northwest, first through a narrow rocky valley, then through a not very fertile plain. Beyond Argenton in the Department of Indre it turns west, forms part of the southern boundary of Indre-et-Loire, and enters the Vienne below Port-de-Piles. Length, 255 kilometers.

CREUTZ, krûêts, COUNT **Gustav Phillip**, Swedish poet and statesman: b. Finland, May 1, 1731; d. Stockholm, Oct. 30, 1785. He was a member of the learned and elegant circle which surrounded the queen of Sweden, Louisa Ulrica, sister of Frederick the Great. His *Atis och Camilla*, an erotic poem in five cantos (1761), and his *Daphne* are considered masterpieces of Swedish poetry. He was appointed minister to Madrid in 1763, and to Paris in 1766. He remained in Paris for 17 years and became particularly acquainted with Jean François Marmontel and André E. M. Grétry. On April 3, 1783 he signed with Benjamin Franklin a treaty of amity between the United States and Sweden. His works and those of his friend Count Carl Gyllenborg are published together under the title *Vitterhets Arbeten af Creutz og Gyllenborg* (1795).

CREUZER, kroi'tsēr, (Georg) **Friedrich**, German philologist and archaeologist: b. Marburg, March 10, 1771; d. Heidelberg, Feb. 16, 1858. He studied at Marburg and Jena, and in 1802 became professor of philology at Heidelberg. In 1807 the professorship of ancient history was also conferred on him, and he held both chairs till his resignation in 1845. His works treat of mythological subjects and classical history, the most important of them being *Die historische Kunst der Griechen* (1803); *Dionysus* (1808); *Symbolik und Mythologie der alten Völker, besonders der Griechen*, 4 vols. (1810-1812); and an edition of Plotinus (1835). His symbolical theory of mythology gave rise to a controversy with Gottfried Hermann,

Voss and others. With G. H. Moser, he edited several of the works of Cicero. A collection of his writings was published in 1854 under the title *Opuscula Selecta*.

Consult Stark, B., *Friedrich Kreyzer, sein Bildungsgang und seine bleibende Bedeutung* (Heidelberg 1875), and Sandys, Sir J. E., *A History of Classical Scholarship*, vol. 3 (Cambridge 1908).

CREVASSE, krē-vās', a deep fissure or crevice in a glacier, caused by movement of the parts at unequal rates or by passage over a rough surface. In the United States the term is also used for a breach in an embankment or levee. See also GLACIER; LEVEE.

CREVAUX, krē-vō', Jules Nicolas, French explorer: b. Lorquin, Lorraine, France, April 1, 1847; d. South America, April 24, 1882. He took part in the Franco-Prussian War, and was later made a surgeon in the navy. In 1876 he turned his attention to the exploration of South America; he first crossed the Tumuc-Humac Mountains; then explored the valley of the Oyapock and its tributaries and several tributaries of the Amazon. In 1880 he crossed the cordilleras of the Andes and reached the Orinoco by the Guaviare River, a tributary never before explored. He returned to France for a short time, but in 1882 started on another expedition, intending to explore the upper part of Paraguay and some of the southern tributaries of the Amazon. On arriving at Buenos Aires he became interested in a plan for the exploration of the Gran Chaco and the Pilcomayo River, and joined an expedition for that purpose. He and all but two of his companions were murdered by the Tobas Indians on the banks of the Pilcomayo. An account of his explorations was published under the title *Voyages dans l'Amérique du Sud* (1883).

CREVECOEUR, krēv-kūr', Michel Guillaume Jean de, French essayist: b. near Caen, Normandy, France, Jan. 31, 1735; d. Sarcelles, near Paris, Nov. 12, 1813. After receiving part of his education in England he migrated to Canada in 1754, served under Louis Montcalm de Saint-Véran in the French and Indian War, and explored the Great Lakes and Ohio River regions. He landed in New York City in 1759, traveled for a decade in New York, Pennsylvania and the Carolinas, then in 1769 married Mehitable Tippet of Yonkers, and settled on a farm in Orange County, N. Y. During the succeeding 11 years of pioneer farming life he wrote the essays which have made his reputation as a delineator of the rural American scene. He was deeply moved by the plight of the poor independent farmer in a province where the feudal manorial system of England had been grafted a century before on the patroonal system of the Dutch. Despite his sympathy for the common people and ardent love of personal liberty, on the outbreak of the American Revolution he favored the Loyalist side, disgusted with profit patriots who were "perpetually bawling about liberty without knowing what it was." In September 1780 he embarked for France. His great work, the sheaf of essays entitled *Letters from an American Farmer*, was published in London over his pseudonym, J. Hector St. John, in 1782. A French version, expanding the original essays, was issued in Paris the next year. After a three-years' absence he returned to America and debarked in New York, Nov. 19, 1783, only to find his wife dead, his

children vanished, and his farmhouse burned in an Indian raid. Eventually he found his children. Appointed French consul in New York, he devoted himself to cementing the friendship between France and the United States born of the war alliance. He corresponded with Washington, was a friend of Franklin, Jefferson, and other leaders of opinion. He wrote extensively for the newspapers over the signature "Agricola." It was his boast that he had introduced to American cultivation such forage crops as alfalfa, sainfoin, and the vetches. The Rhode Islanders who settled a new town in Vermont in 1786 named it Saint Johnsbury in gratitude for Crèvecoeur's assistance. In 1790 he took final leave of his adopted country and returned to France. Some of his unpublished manuscripts, discovered by H. L. Bourdin in 1922, were published in 1925 under the title, *Sketches of Eighteenth Century America*.

CREW, krōō, Henry, American physicist: b. Richmond, Ohio, June 4, 1859. Educated at Princeton University and Johns Hopkins, he was appointed professor of physics at Northwestern University in 1892, and became a distinguished teacher and research physicist, especially in the field of spectroscopy. He retired from the faculty of Northwestern University in 1930 and became chief of the division of basic sciences of the Century of Progress Exposition in Chicago. He is the author of *Principles of Mechanics* (1908), *General Physics* (1908), *Rise of Modern Physics* (1928), and a translation of Maurolycus' *Optics* (1940).

CREW. See NAVAL TERMS.

CREWE, 1st MARQUESS OF (ROBERT OFFLEY ASHBURTON CREWE-MILNES), English statesman and diplomat: b. London, England, Jan. 12, 1858; d. Leatherhead, June 20, 1945. The son of Richard Monckton Milnes, 1st Baron Houghton, he succeeded to the title in 1885. He was educated at Harrow and at Trinity College, Cambridge University, and in 1883-1884 served as assistant private secretary to the 2d Earl Granville, secretary of state for foreign affairs. He was lord in waiting to Queen Victoria in 1886, and lord lieutenant of Ireland from 1892 to 1895. In that year he was created earl of Crewe. From 1905 to 1908 he served as lord president of the council, in 1908 and again from 1912 to 1915 as lord privy seal, and from 1908 to 1910 as secretary of state for the colonies. In 1911 he was created a marquess. After serving as secretary of state for India (1910-1915), he again became lord president of the council, remaining in this office until 1916, when he became president of the Board of Education. In 1917 he was chairman of the London County Council. He served as ambassador to France from 1922 to 1928, and as secretary of state for war in 1931. From 1936 until 1944 he was leader of the Liberal Party in the House of Lords. His published works include *Stray Verses* (1889-1890) and *Lord Rosebery* (1931).

CREWE, municipal borough, England, situated in Cheshire, 30 miles southeast of Liverpool and 158 miles northwest of London, on the main line of the London Midland region of the British Railways. Most of its residents derive their livelihood from the town's large railway works,

which include steel mills, repair and machine shops, and locomotive and railroad car plants. Other establishments produce chemicals and clothing, and process food. Near the town is Crewe Hall, now the property of the Duchy of Lancaster.

A mere hamlet in 1840, Crewe developed rapidly as a center of the then London & North-Western Railway Company, and was incorporated in 1877. Pop. (1951) 52,415.

CREWELWORK, a type of embroidery (q.v.) in which designs are sewed with colored silk or woolen yarn, loosely twisted, on linen or similar materials.

CREWS, krōōz, **Laura Hope**, American actress: b. San Francisco, Calif., 1880; d. New York, N. Y., Nov. 13, 1942. She made her debut at the age of four, and later supported such outstanding performers as Eleanor Robson, Henry Miller, John Drew, and Sir Herbert Tree. Her first hit was in *The Girl I Left Behind Me* (1900); another early success was *The Great Divide* (1906). In 1921 she was in the original cast of the first A. A. Milne play to be presented in New York, *Mr. Pim Passes By*. She created the role of the mother in Sidney Howard's *The Silver Cord* (1926), and played in the Theatre Guild's production of Pirandello's *Right You Are If You Think You Are* in 1927. Her last stage appearance was in *Arsenic and Old Lace* (1942). Beginning in 1929, she appeared in many motion pictures, including *Gone With the Wind*, *Camille* (with Greta Garbo), and *The Man Who Came to Dinner*.

CRIBB, Tom, English pugilist: b. Hanham, Gloucestershire, England, July 8, 1781; d. Woolwich, May 11, 1848. Known as the "Black Diamond" because he had worked as a coal porter, he fought his first professional fight against George Maddox at Wood Green in 1805. Later the same year he suffered the only defeat of his career at the hands of George Nicholls. Cribb conquered the famous ex-champion Jem Belcher in forty-one rounds in 1807, and went on to win the championship from Bob Gregson in 1808. He defended his title twice against Tom Molineaux, an American Negro, in 1810 and 1811. For the next decade he held that championship unchallenged, and retired undefeated in 1821, with the honorary title of champion for life.

CRIBBAGE, a card game whose invention was attributed by John Aubrey to Sir John Suckling (1609-1642, q.v.), but which probably derived from a much earlier game. It may be played by two, three, or four persons. In the four-handed game two persons play as partners against the other two. The two-handed game, considered the best, is here described in greatest

detail. In all forms of cribbage a complete 52-card deck is used, and 61 or 121 points constitute a game. A player scoring 61 points before his opponent scores 31, or 121 points before his opponent scores 61, is credited with winning two games. This is called a lurch, but many players disregard the rule.

Rank of the Cards.—The king is high, and the ace is always low. In the count of the cards, however, all face cards are counted as 10's, and the other cards according to the number of spots or pips on each.

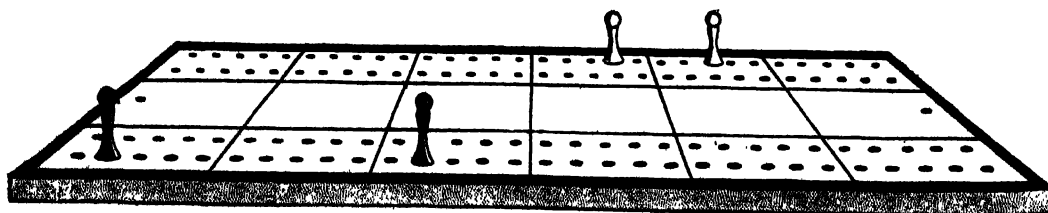
The Deal.—Before play begins, the players cut for deal, and low deals. The cards are then shuffled; either player may do the shuffling, but the dealer always shuffles last. The dealer's opponent cuts the cards, and the dealer deals six cards, one at a time alternately, to each player, beginning with his opponent. The loser of the game deals the next hand.

Misdealing.—Among the various errors classified as misdeals, each of which carries a penalty of 2 points to be scored immediately by the dealer's opponent, are (1) failure to have the cards cut before dealing; (2) exposure of a card while dealing; (3) dealing too many or too few cards to a player; and (4) dealing a card incorrectly (that is, to the wrong person), and failing to correct the error before another card is dealt.

In the event of a misdeal, the player's opponent may call for a new deal by the original dealer, but, except when too many or too few cards have been dealt, he must announce his decision before looking at his own cards. If the dealer has the incorrect number of cards, his opponent can decide whether or not the deal stands; and if he decides in the affirmative, he has the right to draw the superfluous cards: if the dealer has too many—from the latter's hand, placing them on the top of the pack and looking at them if the dealer has seen them. If the dealer does not have sufficient cards, and the deal is allowed to stand, he makes up the deficiency from the top of the pack. If the dealer's opponent is the victim of the misdeal, he must decide before looking at his hand whether or not he wishes the deal to stand. If he decides in the affirmative, he places his surplus cards, if he has too many, on the top of the pack; if he has too few, he requests the dealer to supply the deficiency from the top of the pack.

A new deal is mandatory if a card is faced in the pack, or if the pack is discovered to be imperfect. In such cases the original dealer re-deals. If a player deals out of turn, the deal may be stopped at any time before opposing player takes up his cards. The penalty for dealing out of turn is 2 points to be scored by the opposing player, but if the latter has taken up his hand before attention is called to the improper deal, it stands, and no penalty can be exacted.

The Crib.—In the two-handed game, after



Cribbage score board.

completion of the deal, each player discards two cards, face down on the table. These discards constitute what is called the crib, and belong to the dealer, who, however, makes no use of them until after all cards in the hands have been played. He then counts and scores all points contained in the crib in combination with what is called the starter.

The Starter.—After the discard, or formation of the crib, the nondealer again cuts the cards, and the dealer then turns the top card of the bottom pack face up on the reunited pack. This turned-up card is called the starter in the United States; in England it is sometimes called the start or turnup. If the starter happens to be a jack, the dealer immediately scores 2 points for "his heels." If he fails to peg his score before playing a card, he forfeits his points. The starter is never used during the play of the hands, but only in counting the hands and the crib after all cards have been played.

Objects of the Game.—The objects of cribbage are to form various counting combinations of the cards, such as pairs, triplets, fours, sequences, and fifteens. These may be formed by the fall of the cards during the play, or they may be found in the hands or in the crib, in combination with the starter, after the play is over.

Play of the Cards.—After the starter has been turned, the nondealer plays a card from his hand face up on the table immediately in front of himself, announcing as he lays it down the number of pips appearing on it. Face cards are announced as 10's. The dealer then plays a card face up in front of himself, but instead of simply announcing the number of pips on it, he adds its value to the value of the card played by his opponent and announces the total. Thus, if the first card played was a 5 and the second a 6, the player of the latter announces "11." This manner of playing and totaling the values of the cards played is continued until all the cards have been played, or until neither player can play a card without passing 31. If a player whose turn it is to play has no card in his hand that can be played within the limit of 31, he so states, and thereafter his opponent, if he can do so, continues to play until the count reaches 31, or until he too can no longer play without passing 31. This is called a go. The player who approaches nearest to 31 during the play scores 1 point; if he reaches exactly 31, he scores 2 points. After 31 has been reached or a go has been declared, the players turn the cards face down in front of themselves, and the play is continued with the cards remaining in their hands, just as though no cards at all had been played, the player entitled to the next play leading off. The players always play alternately except when one announces he can no longer play without passing 31, and his opponent has cards which can still be played.

Points Which May Be Scored in Play.—

Fifteens.—If a player lays down a card which makes the count of the cards played exactly 15, he scores 2 points, announcing "fifteen—2." If, for example, the first card played was a 7, the second a 3, and the third a 5, the player of the last card scores 2 points for the fifteen.

Pairs.—A pair is made when a player lays down a card equaling in numerical value that of the last card played, as a 5 after a 5, or a queen after a queen. The player forming the pair scores 2 points.

Triplets.—Triplets are formed when three

cards of the same denomination are played one after the other. They are called pairs royal, and the player forming a triplet scores 6 points for the three pairs which can be made of the three cards. If, for example, the three cards are the 5 of hearts, 5 of spades, and 5 of diamonds, the 5 of hearts and 5 of spades make one pair; the 5 of hearts and 5 of diamonds, a second pair; and the 5 of spades and 5 of diamonds, a third.

Fours.—Called double pairs or double pairs royal, fours are made when four cards of the same denomination are played, one after the other. The player playing the fourth card scores 12 points for the six pairs which can be made from the four cards. These 12 joints are scored in addition to the 6 points which his opponent may have scored when the triplets (the first three cards played) were formed, just as the maker of triplets scores 6 points even though his opponent may have just scored 2 points for forming a pair.

Sequences.—Sequences, scoring 1 point for each card in the sequence, occur when three or more cards in numerical order are played, even though they were not played in numerical rotation. In other words, 9-7-8 is as much of a sequence as 7-8-9. A three-card sequence scores 3 points, and a four-card sequence 4 points, in addition to the 3 points which the opposing player possibly, or very probably, scored previously. The ace being low, the ace, king, and queen do not make a sequence, but the ace, deuce, and trey do. The king, queen, and jack make a sequence, although all rank as 10's in the count of the cards. An intervening card or duplicate breaks the sequence; thus, 2-3-6-4 cannot be counted as a sequence, nor can the second 5 be so counted in 3-4-5-5, the first 5 breaking the sequence insofar as the second 5 is concerned.

Maximum Count.—With respect to the formation of pairs, triplets, fours, and sequences, it must be remembered that in no case may the count of the cards exceed 31. The various counting combinations may be made when the players play alternately, or by one player playing from his own hand all the cards that will play within the limit of 31 after his opponent has announced that he can no longer play without passing 31.

Compound Scores.—It is possible to make more than one of the counting combinations at the same time. Thus, 5-5-5 counts as three pairs, scoring 6 points, and also as a fifteen, scoring 2 additional points; 4-5-6 counts as a three-card sequence, scoring 3 points, and also counts as a fifteen, scoring 2 additional points.

Count of the Cards.—When all cards have been played, the hands are taken up and counted aloud, the nondealer counting first and pegging his score as he counts. Next the dealer counts his hand, pegging his score as he counts, and then counts the crib. In counting the hands, each player includes the starter as part of his hand, so that he actually counts five cards. Likewise, the dealer, in counting the crib, includes the starter in the count. The combinations in the hands which entitle the players to score are fifteens, pairs, triplets, fours, sequences, and flushes (all cards of the same suit). In addition, if either player holds the jack of the same suit as the starter, he scores 1 point for "his nob."

Fifteens.—In counting the hands and the crib, the player is entitled to count all combinations of cards which, taken together, make exactly 15, and scores 2 points for each fifteen so made. All face cards are counted as 10's, so that a

player holding a king, queen, or jack and a 5, counts fifteen and scores 2 points. If he holds a face card and two 5's, he counts two fifteens, and so on. Holding two face cards and two 5's, he can count four fifteens and scores 8 points.

Pairs, Triplets, and Fours.—These are counted and scored as in play, pairs scoring 2 points each; triplets, 6 points; and fours, 12 points.

Sequences.—As in play, sequences score 1 point for each card in the sequence of three cards or more, but in counting the hands a card of one denomination may be substituted for another card of the same denomination and counted as another sequence; thus, 3-4-5 counts as two sequences, and if the starter happened to be a 5 also, three sequences could be counted.

Flushes.—If all cards in the hand belong to the same suit, it is counted as a flush, and the holder scores 1 point for each card. If, in addition, the starter is also of the same suit, it counts as a five-card flush, scoring 5 points. In counting the crib, however, a player cannot count a flush unless the starter as well as the other four cards all belong to the same suit.

Maximum Count.—The highest possible score that can be made on one hand is 29—for holding three 5's and the jack of the same suit as the starter, with a 5 turned up. Such a hand counts 12 points for the fours, 8 points for the four fifteens that can be made with the jack and the four 5's, 8 points for the four fifteens that can be made from the four 5's, and 1 point for "his nobs."

Score Board.—Points made in play and in the count of the hands and the crib are scored on a board into which four parallel rows of holes—30 holes to the row—and 2 extra holes, 1 in the center of each end, called game holes, have been drilled. This board is placed between the players, who usually score from opposite ends. Each player is given two pegs which fit into the holes in the board. As points are made, the player making them moves his back peg forward, indicating the points made and the total score.

Five-Card Two-Handed Cribbage.—As in the six-card game, the cards are dealt alternately, one at a time to each player, and each discards two into the crib, so that each player holds only three cards in his hand. On the first hand played in each game the nondealer scores 3 points to compensate for the advantage which the deal gives his opponent. When either player reaches 31 or says "go," the play stops, the score for 31 being 2 points, and that for go 1 point. Thereafter, the hands and the crib are shown and counted as in the six-card game.

Three-Handed Cribbage.—Cards are cut for deal, which passes to the left. Five cards are dealt to each player, one at a time, and each player discards one card for the crib. Points are scored on a triangular board containing three double rows of holes (30 holes to the row), and a game hole for each player. Points are scored and the game is played as is the two-handed game.

Four-Handed Cribbage.—Two of the players play as partners against the other two. One player on each side does the scoring, and the other players are not permitted to touch the board or the pegs. Five cards are dealt, one at a time, to each player, beginning with the player to the dealer's left, and the deal passes to the left. Each player discards one card into the crib, which belongs to the dealer. The player on the dealer's left cuts for starter. He also begins the

play, which passes to the left, the dealer playing and counting his hand last.

Consult Lenz, S. S., *Cribbage: Fundamentals and Fine Points* (New York 1946); Culbertson, Ely, *Culbertson's Hoyle The New Encyclopedia of Games with Official Rules* (New York 1950); Kempson, Ewart, and others, eds., *Hoyle Up-to-Date: The Official Rules of Card Games* (London 1952).

CRICHTON, kri't'n, James (known as THE ADMIRABLE), Scottish scholar: b. Aug. 19, 1560, d. Mantua, Italy, July 3, 1582. The elder son of Robert Crichton, lord advocate of Scotland, he was probably born on his father's estate at Elioock, Dumfries. He entered St. Andrews University at the age of 10, and soon distinguished himself for his remarkable learning and linguistic ability. He received his B.A. degree in 1574, and his M.A. in 1575. In that year he was selected to be a companion of the young king, James VI in his studies. At the end of 1577, Crichton went to France, where he continued his studies and served for two years in the French Army. A handsome youth and a skilled athlete and swordsman, he won widespread admiration. According to one account, he offered to answer questions in 12 languages on any topics in the sciences and liberal arts, and did so on the appointed day. In 1579 he went to Genoa, where he was well received and published a Latin address to the Senate. At Venice, in the following year, he was introduced to the doge and the Senate. There and in Padua, where he went in 1581, he won acclaim for his Latin verses and his brilliant extemporaneous discourses on philosophy, theology, and mathematics. In Venice he made the acquaintance of Aldus Manutius, who introduced him to other scholars, with whom he debated on learned subjects. In Padua he challenged the professors of the university to a debate on Aristotle and mathematics, in which he came off handsomely. Early in 1582 he went to Mantua, where he became tutor to Vincenzo Gonzaga, son of the duke. Attacked one night by a party of armed and masked men, Crichton recognized one of them as his pupil and offered him his sword. The young prince immediately ran him through with it. This account of his death has been corroborated by documents in the archives of Mantua, and later references to a James Crichton in Milan would seem to pertain to another Scot of the same name.

Consult Crichton, Douglas, *James Crichton of Elioock* (St. Andrews 1911); Whibley, Charles, *Essays in Biography* (New York 1913).

CRICHTON-STUART, John Patrick. See STUART.

CRICKET, the name applied to a family of insects (Gryllidae), belonging to the order Orthoptera. Crickets differ from grasshoppers and locusts in that the wings lie flat over the abdomen, which is broader than it is high. The antennae are long and tapering, the tarsi are divided into three segments, and the ovipositor is spear or awl shaped. There is a pair of unsegmented cerci at the apex of the abdomen.

The common field crickets belonging to the genus *Gryllus* are usually blackish or dark brown, but a few are brown or yellowish brown. Most of them reach maturity in the late summer or autumn. Their chirp, or song, is produced by rubbing the upper wings together. On the costa or front edge of each of these is a section bear-

ing a many-toothed ridge; when the teeth are rubbed rapidly together the song, which is different in each species, is produced. The house cricket, *Gryllus domesticus*, prefers the warmth of a household, where it keeps up its cheerful chirping for the greater part of the year. The presence of house crickets in a home has been traditionally regarded as an omen of good luck.

Crickets are mostly vegetarians, but some feed on other insects, and they may damage starched clothing. Poisoned baits and DDT sprays will destroy them. See also FIELD CRICKET; MOLE CRICKET; TREE-CRICKET.

CRICKET, the national game of England, also played in the United States, Great Britain, Australia, South Africa, New Zealand, India, Canada and West Indies. Two opposing teams with eleven players on each side aim to make the highest number of runs. Wickets, consisting of three stumps, are pitched in the ground 22 yards apart. (F.B.)

Origin.—Cricket, like other bat and ball games, was not "invented," but slowly evolved from ancient Egyptian folk-fertility rites. Efforts to connect it with the Scottish "Cat and Dog," a 15th century "Handyn Handoute," the French Crique, and an uncertain "Creag" have not been successful, but all such games are related.

The name cricket probably comes from the Saxon *crice*, since there are so many forms of this word for the instrument used in the early generic games of club and ball. But the immediate ancestor of the game is stoolball, an Easter ball custom, associated with the church. Stoolball games were the times *par excellence* for courting between youths and maidens who participated; a characteristic definitely relating the game with the ancient springtime fertility rites.

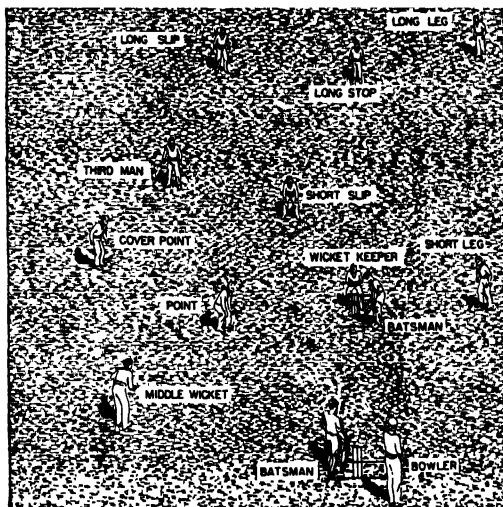
In stoolball, one player threw a ball at an upturned three-legged stool, defended by another player. It was perhaps known in 1330, certainly by 1450. Later a second stool was added. A stool is also called a cricket, and it is possible that this was the origin of the name. However, this use of the word was not noted till 1643, whereas the earliest known reference to a game called cricket is in 1598, in Florio's Italian-English dictionary, *A World of Words*. Until further evidence is found, we conclude that the game came from stoolball, as did baseball (q.v.), but the name came from *crice*, the Saxon stick. Modern cricket came of age with the printing of the first rules in 1744. (R.W.H.)

The Modern Game.—Cricket stands pre-eminent in England among the many outdoor pastimes pursued during the summer months. Cricket is not solely a game of skill; chance is also a factor, and condition of the pitch and weather are so influential that in some cases a side which appeared to have little prospect of success has come out victorious.

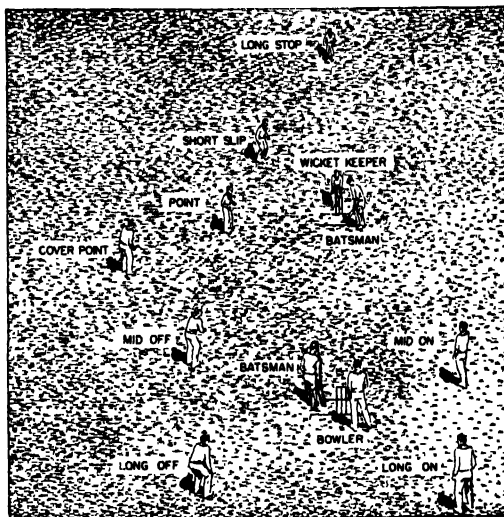
Cricket was originally either single wicket or double wicket, but as single wicket is now only played by boys or when numbers are few, we can safely confine our attention to the double wicket. For a double wicket game eleven players on each side are necessary. After the captains have tossed a coin to settle who shall have choice of innings, the captain of the fielding side places his men, and the other captain usually opens the innings by sending in two of his surest and safest batsmen to defend the wickets and to make the runs. The purpose of the opening bats-

men usually is to take the edge off the fresh bowling to make way for aggressive and big-hitting batsmen.

The placing of the field depends entirely on the style of bowling, whether it be fast, medium-pace, or slow.



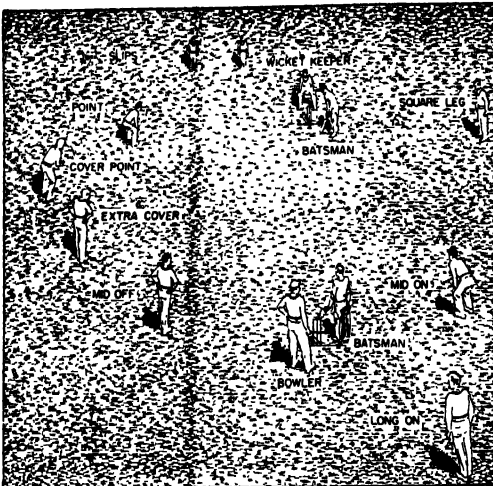
Cricket field set for a fast bowler.



Cricket field set for a slow bowler.

The field having been duly placed, and the batsmen having taken their stand, the umpire calls "play," and the bowler sends down his first ball. After six balls have been delivered from one wicket (in some countries eight are bowled; in England eight is optional, but six balls are used in all first-class matches) the umpire calls "over," and the field is reversed subject to slight positional changes at the discretion of the captain or the bowler. These "overs" continue to be bowled from alternate ends until the eleven batsmen have been disposed of.

When the tenth wicket falls, the remaining batsmen automatically retire and the other side now comes to bat. Runs are made by the bats-



Cricket field set for a modified slow "off theory" bowler.



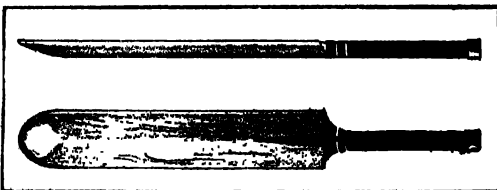
Cricket batting stance.

man driving the ball far enough away to give him time to change places with the batsman at the other end, before the ball returns. Each change constitutes a run. Six is the largest number of runs that can be made from a single hit, that occurring when the ball is driven clear off the pitch or out of the grounds. A six could also be run by a fielder overthrowing when returning the ball to the wicket-keeper.

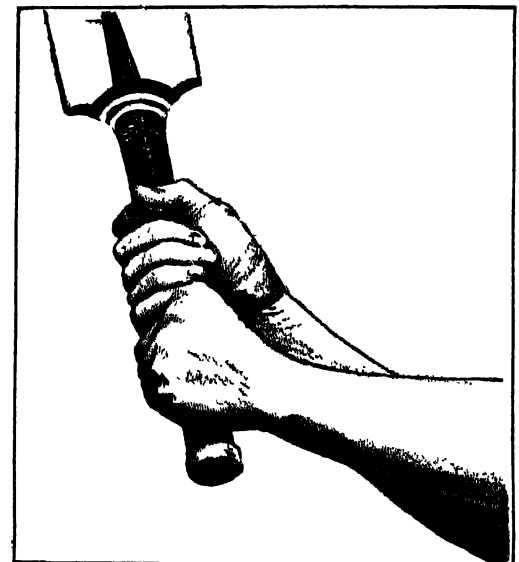
The task of the bowler is to try in every possible way to dislodge one or both of the bails resting on top of the stumps defended by the batsman, or else to tempt him into hitting the ball into the air so that it may be caught before bouncing by one of the fielders.

Besides being bowled or caught, a batsman may be "run out," that is, have his wicket hit by the ball while he is attempting to score a run, or he may be "stumped-out," which is to have the same thing happen when he rashly steps out of his crease to strike a ball and misses, enabling the wicket-keeper to whip off the bails. The batsmen can also be out "leg before wicket," which means that his legs have been struck by a ball that normally would have struck his wicket. He can also be out, knocking off the bails with his own bat.

The ball usually comes to the batsman on the first bounce and the bowler's skill is shown in varying the pitch, speed and direction of the ball so that the batsman is uncertain whether to play forward or back. One of the best forms of bowling is what is known as "bowling with the break," the peculiarity of which consists in that the ball after striking the ground does not continue straight on, but swerves or spins sharply to right or left like a "cut" tennis ball.



Cricket bat.



Proper grip.

which normally could not be finished in the time allowed.

Three full days are usually required for a first-class two-innings match. Bad weather, or a collapse by the batsmen of one team, could curtail a first-class match to two-days, or even one-day's play. Consistent rain would prevent a match being started. In test matches in Australia the games are sometimes played to a finish and go

The art in batting is to play with a "straight back," that is, as far as possible to swing the

on for many days. In Canada there are clubs in many cities, towns and villages.

Revision of the Laws.—The Marylebone Cricket Club (M.C.C.) prepared the final draft of their proposals for revised laws of cricket to be submitted to a special general meeting at Lords on May 7, 1947. The new laws were scheduled to come into effect in the English season of 1948.

There are not any drastic alterations. In fact, the M.C.C. removed some ambiguities and put the laws into logical sequence. Thus the 47 laws, a reduction of 13 from the existing number, are divided into five sections: (1) players, umpires, and scorers; (2) implements of the game and the ground; (3) care and maintenance of the pitch; (4) conduct of the game, and (5) duties of umpires.

There are two outstanding revisions. The first means that no longer will a wicket be held to be "down" if a bail merely had been dislodged. The new law stipulates that a bail must be separated from the top of the stumps, and a note has been added covering the possibility of a ball lodging between two stumps. In this case the wicket also will be considered broken. To avoid any danger of the bails lodging together over the center stump, each is to be shorter by one eighth of an inch.

The other important revision concerns the last over of a match. The M.C.C. propose that this shall be played right out at the request of either captain, even if a wicket falls after "time" has been reached. Under existing law, if a wicket goes down within two minutes of time, stumps are pulled unless the incoming batsman claims his right to bat for the time remaining, and if a batsman is out after "time" has been reached, play ceases at that point.

As the present rules concerning "stumping" and "run out" can confuse umpires, the M.C.C. now state that the striker is stumped "if, in receiving a ball, not being a no-ball, delivered by the bowler, he be out of his ground otherwise than in attempting a run, and the wicket be put down by the wicket-keeper without the intervention of another fieldman. Only when the ball has touched the bat or the person of the striker may the wicket-keeper take it in front of the wicket for this purpose." The proposed laws make it clear that the striker, in playing at a ball, may not be given "run out" when the wicket is put down by the wicket-keeper unless in the opinion of the umpire he attempts a run which is, in fact, the original conception of the rule.

In making it clear that the striker has the right to guard his wicket without interference, M.C.C. have insisted that the wicket-keeper shall remain wholly behind the wicket until the ball touches the bat or person of the striker. This will eliminate, among other things, the difficulty for an umpire of defining the difference between a snick and a ball struck up. Since the wicket-keeper cannot anticipate that a snick justifying his taking the ball in front of the wicket will occur, he will not be tempted to do so, thereby risking losing the opportunity of stumping, especially as he must not interfere with the striker.

Both in the law as rewritten, and in a note on the law, stress has been laid on the fact that the height of the point of impact, even though above the level of the bails, is immaterial provided the ball would hit the wicket. It has also been clarified that the word "pitched" includes a full pitch.

To give umpires full power to prevent bat-

men obtaining leg-byes by deliberately deflecting the ball, M.C.C. have altered the note which says that "if the striker kicks the ball wilfully, no runs shall be scored" to "if the striker wilfully deflects the ball with any part of his person, no runs shall be scored and the batsmen may not change ends."

Although umpires have always possessed the power to stop a bowler running down the wicket after delivery and causing such damage as might unduly assist the bowler at the other end, they have now received written authority to forbid this as "unfair play."

The M.C.C. have defined the pitch which is named as the area of ground between the bowling creases, 5 feet in width on either side of the line joining the center of the wickets. After the toss for innings, the umpires are to control the use and maintenance of this.

Bibliography: Daft, R., *Kings of Cricket* (London 1893); Read, W. W., *Annals of Cricket* (London 1896); MacLaren, A. C., *Cricket Old and New* (London 1924); Altham, H. S., *History of Cricket* (London 1926, revised 1938); Wyatt, R. E. S., *The Inns and Outs of Cricket* (London 1939); Warner, Sir Pelham, *Cricket Between Two Wars* (London 1942); Preston, Hubert, *Wisden's Cricketers Almanack* (published annually London).

(F.B.)

(R.W.H.)
(F.B.)

ROBERT W. HENDERSON
FRANK BUTLER.

CRICKET FROG, a small frog (*Acris gryllus*; northern species are variety *crepitans*), abundant throughout the warmer parts of the United States, east of the plains, and noted for its rattling cricketlike cries in spring. It is about an inch long, brownish, with a blackish triangular patch between the eyes, the borders of which are light colored, continued as a dorsal band to the rear end of the body; throat in spring yellow and legs barred; but all these colors change with surroundings, as the species possesses the power of metachrosis in a high degree. "The note of this species," says Cope, "may be exactly imitated by striking two marbles together, first slowly, then faster and faster, for a succession of about 20 or 30 beats. The noise cannot be heard at a very great distance . . . it keeps on the high grass in and around marshy places, seldom if ever ascending trees or bushes. When pursued it leaps with prodigious agility and hides under water." Their eggs are deposited in April, in little masses attached to the blades of coarse grass. A short time afterward all the great numbers which make the marshes so noisy in April and May die off, so that until the eggs hatch and the young "peepers" develop late in August, the species is practically extinct. The cricket frog feeds on insects, the larvae and pupae of crickets and grasshoppers. Its ability to make prodigious leaps enables it to capture many flying insects. In the eastern United States it has not been reported north of southern New York and Connecticut. Consult Dickerson, *The Frog Book* (New York 1906); Wright, A. H., and Allen, A. A., "Notes on the Breeding Habits of the Swamp Cricket Frog," *American Naturalist*, 42:39-42 (1908); Wright, A. H., *Frogs: Their Natural History and Utilization*, Bulletin, Bureau of Fisheries, Doc. 888 (1920); Morgan, A. H., *Field Book of Ponds and Streams* (New York 1930).

CRICKET ON THE HEARTH, The, a Christmas book by Charles Dickens, published in 1846. The title is suggested by the singing match between the kettle and a cricket on Dot Peerybingle's snug little hearth, a contest which the cricket wins. John Peerybingle, carrier, is led to doubt the sincerity of his wife Dot by venomous old Tackleton who is about to marry young May Fielding. The Peerybingles' eccentric elderly boarder is discovered by John to be actually a bright young man in disguise. Influenced by the cricket on the hearth, John decides to pardon his wife whose guilt he no longer doubts. All ends happily when the mysterious young man turns out to be Edward, son of Caleb Plummer, the toy maker, come home from South America just in time to save his sweetheart May from marriage to Tackleton. Other characters include Caleb's blind daughter Bertha, and Tilly Slowboy, a most loving but thoroughly incompetent nurse. In 1859 Joseph Jefferson played the part of Caleb Plummer in Dion Boucicault's dramatization of the story. It became one of his favorite roles performed for over forty years in the United States, Australia and England. The Viennese composer Carl Goldmark composed an opera founded on Dickens' story entitled *Das Heimchen am Herd* which was produced in Vienna and Berlin in 1896, and in English versions in England in 1900 and the United States in 1910. Still another operatic version was composed by Sir Alexander Campbell Mackenzie and produced at the Royal Academy of Music, London, in 1914.

CRIDGE, Edward, Canadian bishop: b. Devonshire, England, Dec. 17, 1817; d. Victoria, British Columbia, Canada, May 6, 1913. A graduate of St. Peter's, Cambridge, he was ordained priest in the Church of England (1849). Appointed chaplain of the Hudson's Bay Company in Vancouver Island in 1854, he resigned his rectorship of the church at Victoria in 1874, joined the Reformed Episcopal Church and, in 1875, was elected bishop, an office he held until his death. His diocese included all Canada and the United States west of the Rocky Mountains. He published *As it was in the beginning* (Chicago 1890).

CRILE, krīl, **George Washington**, American surgeon: b. Chile, Ohio, Nov. 11, 1864; d. Cleveland, Ohio, Jan. 7, 1943. He obtained his bachelor degree at Ohio Northern (1884) and M.D. at Western Reserve University (1887), then studied in Vienna, London, and Paris before commencing practice in Cleveland. In 1905 he performed the first direct blood transfusion, and the same year discovered that adrenalin could restore the heart beat of an apparently dead person. He perfected blood transfusion techniques, and performed the first successful thyroid operation, a type of surgery in which he was unexcelled. His most important medical discovery was nerve-block anaesthesia. In 1921 with others he founded the Cleveland Clinic for clinical and research activities. Among his many works are *Origin and Nature of the Emotions* (1915); *Man, An Adaptive Mechanism* (1916); *Problems of Surgery* (1928); *Intelligence, Power, and Personality* (1941).

CRILLON, krē-yôn', **Louis Balbis de Ber-ton de**, French soldier, known as **L'HOMME SANS PEUR** (THE FEARLESS): b. Murs, Provence, Mar.

5, 1543; d. Avignon, Dec. 2, 1615. His family was of Piedmontese origin. As aide-de-camp to the duke of Guise he aided importantly in the reconquest of Calais and Guines (1557), was present at the capture of Rouen (1562), and fought in the principal battles of the religious wars. At Lepanto (1571) he performed prodigies of valor and, though wounded, was appointed to carry news of the great victory to the pope and the king of France. Again wounded at the siege of La Rochelle (1573), he later served in Poland with the duke of Anjou. Wounded at the taking of La Fère (1580), he was promoted *mestre de camp* (colonel), then lieutenant-colonel general. After the day of the Barricades he defended Henry III and followed him to Blois. The king, wishing to rid himself of the duke of Guise, tried to persuade Crillon to assassinate him, but the hero scorned such foul play. In 1589 he defended the bridge of Tours against the duke of Mayenne. Though wounds prevented him from fighting at Arques, he fought at Ivry (1590). In 1600 with Sully he commanded the army of Savoy, but soon after retired to Avignon. Henry IV's affectionate message to him after Arques was epitomized by Voltaire in the memorable: "Hang yourself, brave Crillon: we fought at Arques, and you were not there."

CRIME, a word signifying in its legal acceptation any act to which the law attaches a penalty or punishment, without any reference to its moral turpitude. The common-law division of crimes was into treason (q.v.), felony (q.v.) and misdemeanor (q.v.). In the United States treason is usually classed as a felony and the distinction between felonies and misdemeanors hinges upon the degree of punishment prescribed for the crime, a felony being punishable by loss of life or by incarceration in a state prison for at least a year and by the deprivation of civil rights, and a misdemeanor being punishable by a fine or by imprisonment in a workhouse or by both. To constitute a crime, there must first be an act, since a mere opinion or intention, however wrong from a moral or religious point of view, if not carried into an act, cannot be treated as a crime, although the criminality of the act, when done, may be partially or entirely dependent upon the intention of the actor. The true and only reason for making any given act a crime is the public injury that would result from its frequent perpetration. Each individual instance constituting an individual injury, frequent repetition would make it a social injury. Society accordingly takes the most efficient measures for its prevention by appealing to the fears of mankind. The crime is first accurately defined, the requisite punishment attached to it, and then government itself becomes a party to the prosecution of the offender, in order to ensure the carrying into effect of the penalty. While the only legitimate object of punishment is to protect society against a repetition of crimes, humanity dictates that the reformation of the offender should also, if possible, be effected. But as government has no concern with men, except as members of society, it is obvious that their moral improvement can never be made the primary object of punishment. Self-protection is at once the foundation and the end of the power exercised by society in punishing its members. In preventing the repetition of crimes, punishment is designed to operate both upon the individual offender and

upon the community at large. Upon the offender himself it operates by physically disabling him from repeating the offense, or by dissuading him from it through the recollection of past suffering, or by both of these means. Upon the community at large it operates only by the terror of example. Consequently it follows that the mode and degree of punishment are to be determined not so much by the abstract nature of the offense as by the probability of its frequent repetition; and also that no act should be punished at all, the repetition of which does not injuriously affect the temporal welfare of society. Insanity, infancy, coercion, or duress may excuse an act otherwise criminal in the degree that they destroy the voluntary nature of the act, which is therefore performed by the agent without specific criminal intent. See also *CRIMINOLOGY*; *FINGERPRINTING*.

CRIME AND PUNISHMENT, a Russian novel by Fyodor Mikhailovich Dostoyevsky, considered his masterpiece in fiction. An outline of the story, a psychological study of a murderer, may reveal why its publication in 1866, was a great literary event.

Rodion Raskolnikov, a law student in the University of Petersburg, has written an article on crime. As he has not been informed that the article was accepted, and as the small pittance that his mother and sister have been in the habit of sending him has inexplicably ceased coming, he is reduced to such straits that he has been obliged to pawn some of his possessions and is deeply in debt. He decides to murder Alena Ivanovna, a disreputable old woman who lends money on pledges and is reputed to be very rich. He argues that if great conquerors like Napoleon and Alexander the Great, who had won fame and glory by their colossal crimes, were justified by their successes, it would not be wrong for him to rid the world of a hard and evil usurer, and then, by taking the thousands of rubles which he should find in her possession, to pursue his career without the sordid cares that are blocking his way. He takes a hatchet, which he fastens by a loop to the inside of his cloak, and wrapping up a chip and a piece of iron as a pretended pledge, he goes to her apartment.

Everything favors the accomplishment of his scheme. He finds the suspicious old woman alone, and while she is untying the knot around the package, he strikes her on the head and kills her. Hastily ransacking the inner room, he fails to find the great sums of money which are hidden about, but picks up a few pieces of jewelry and a pocketbook stuffed with bank notes. While he is at work, the old woman's half sister enters the outer room. He strikes her down also, and then, hearing steps, he for the first time thinks to bolt the door. Some persons try to enter. They ring and knock, and suspecting something is wrong, go to find the janitor. Raskolnikov manages to escape. In order not to meet the two visitors coming back with the janitor, he steps into a room just vacated by two painters and there accidentally drops one of the jewel cases. Undetected, he leaves the house. Reaching his room he regards his booty, insignificant as it is, with a sort of horror. He goes to a deserted house and buries it all under a large stone. Returning to his room he discovers blood on his boots and on his clothing. He tries to get rid of all such incriminating evidence. He cannot, however, eliminate his conscience. His

crime haunts him day and night. He becomes ill, and his friends cannot understand his actions, which are those of a crazy man. He is constantly impelled to visit the police station and to revisit the scene of his crime. He is as yet safe from suspicion, since one of the two painters, who had left the apartment house just about the time of the murder, has confessed to being the perpetrator. The inspector of police, who has read Raskolnikov's article, now published, and has a high idea of the young man's abilities, has gathered from his wild talk that he is the criminal. He advises him to confess and bear his punishment like a man; he intimates that his sentence will be mitigated by such action. In the meantime Raskolnikov has confessed his crime to Sonya, a girl of the town, the victim of cruel circumstances. He had met her through a chance acquaintance with her father, an official degraded by drink, and had become greatly interested in her. Raskolnikov finally yields to Sonya's earnest entreaties, goes to the police station and is sentenced to eight years of hard labor in Siberia. The young girl accompanies him, and by her utter devotion brings him back to sanity and complete repentance.

There are subordinate threads of plot, involving Raskolnikov's mother and sister and a wealthy roué named Svidrigailov, who in spite of his rascalities has the saving grace of a generous spirit: he is a character worthy of Dickens. The episode of his suicide is depicted with startling power. So is the tragic end of Sonya's father. The scene of his funeral reaches the highest degree of pathos, mingled with a touch of sardonic humor. One of the most famous episodes in the story shows Sonya reading the New Testament to her unhappy friend: the prostitute and the murderer make a picture which haunts the memory with its realism and its dramatic poetry.

The power of the novel consists in its exhaustive analysis of the motives and reactions of a man who is on the verge of insanity and yet who is shown to be responsible for his deeds. Dostoyevsky had in his own life made a firsthand acquaintance with the lives of the poorest and most degraded people. He understood, as few have, their trials and temptations, and he deploys before the reader a remarkable series of scenes in a style evidently greatly influenced by Charles Dickens as well as by Nicolai Vasilievich Gogol, "the father of Russian realism." The descriptions of the murder, of the meeting of Raskolnikov and Marmeladov at the low *traktir* where the drunkard tells his life story, of the funeral dinner given by Marmeladov's widow and of the life of the exiles in Siberia, which Dostoyevsky knew at firsthand—all these and many more are executed with a masterly pen. The beautiful and touching epilogue wherein Raskolnikov comes to himself lifts the tale from a wholly sordid, depressing, gloomy, and pessimistic tragedy into the serene light of optimism: it fully compensates for the long pages of hypochondriacal psychological analysis, which however microscopic and scientific are yet morbid and unwholesome.

Immediately after the book's publication, a murder was committed by a student at Moscow in almost precisely the same way as that described by Dostoyevsky. He himself remarked that he seemed "to be like a criminal who had committed some terrible deed that weighed on his conscience." The book was anonymously translated into English from the French version and pub-

lished in London in 1885, and in New York the following year. It forms the third volume of the complete works of Fyodor Dostoyevsky, translated from the Russian by Constance Garnett.

NATHAN HASKELL DOLE.

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CRIMEA, krī-mē'a (Russ. КРИМ), the Crimean Region (or oblast) of the Russian Soviet Federated Socialist Republic of the Union of Soviet Socialist Republics. The Crimea is a peninsula on the northern shore of the Black Sea. It is washed on the west and south by the Black Sea, on the east by the Kerch Strait (which separates it from the Caucasus), and on the northeast by the Sea of Azov. The peninsula is connected with the Ukrainian mainland by the narrow Perekop Isthmus, which is little more than three miles across at its narrowest point. The peninsula has a maximum length of 200 miles east to west, a breadth of 130 miles north to south, and a total area of 10,036 square miles.

The Crimea is divided into three distinct geographic zones. The northern four fifths of the peninsula is a semiarid treeless steppe, similar to the south Ukrainian steppe, of which it is a continuation. This Crimean steppe specializes in the growing of high quality, quick-ripening grain. Other main crops are tobacco, fruit, and cotton. Sheep are the chief livestock, though in general livestock raising is a secondary occupation. Most agriculture in the steppe area is conducted by collective farms.

Below the steppe, and stretching from west to east across the southern Crimea, are the low, wooded Crimean Mountains, a westward continuation of the Greater Caucasian range, which constitute a climatic barrier. To the north, the steppe has the typical continental climate of European USSR, with cold winters and hot summers. Below the mountains is the third Crimean geographic zone, the Russian Riviera, a narrow seacoast lowland two to six miles wide, with a Mediterranean climate of warm winters and dry summers. Because of this climate, and its beautiful scenic contrast of sea and mountains, the lowland is called the all-USSR resort. Here are located innumerable sanatoria and rest homes (many of which were former palaces of the czarist nobility). Both the mountain valleys and the coastal lowland grow large crops of fruit, tobacco, and grapes, partly for export, and partly for shipment to other regions of the USSR. State farms are the main form of agricultural organization. Fisheries extend along the Crimean coasts, particularly in the Sea of Azov, the Kerch Strait, and on the Russian Riviera.

Crimean industry consists mainly of food-processing plants, especially tobacco factories, wineries, and canneries for vegetables, fruit, and fish. Here are produced the best tobacco and wine in the USSR. However, there is also a sizeable heavy industry. Marble and other building materials are mined in the mountains, and salt is extracted from the Sivash marsh along the Azov coast. The Kerch Peninsula (east tip of the Crimea) has some of the largest iron ore and natural gas deposits of the entire USSR. As yet, the natural gas has been little exploited, but the iron ore (reserves estimated at 2,726,000,000 metric tons, with average iron content

of 35 per cent) is mined extensively at the Kamysh-Burun mines near Kerch. Part of the ore is smelted into iron and steel at the metallurgical plant in Kerch, and part is shipped across the Sea of Azov to the Ukrainian port of Zhdanov (the former Mariupol) for processing.

The Crimea exports to other regions of the USSR, iron, steel, iron ore, wine, tobacco, canned vegetables, fruit, and fish. The main imports from other Soviet regions are: coal from the Donets Basin; petroleum from the Caucasus; timber from the Caucasus and Belorussia; textiles from the Moscow and Ivanovo regions; and butter from north European Russia.

The Crimea has often been called a "mosaic of races," because at one time or another various ethnic groups have controlled the peninsula wholly or in part, and their descendants still live in the area. However, today the great majority of the population consists of Russians and Ukrainians. The Crimean Tatars, who ruled the peninsula for many centuries, now live mainly in the mountains. The population is highly urbanized, over 50 per cent living in cities. This is due not so much to industrialization, as to the many seaports and resorts. The chief cities of the Crimea are Simferopol, the capital (pop. 1939, 142,678); Sevastopol, a naval shipbuilding center and the main Soviet naval base on the Black Sea (pop. 1939, 111,946); Kerch, a large fishing port and metallurgical center (pop. 1939, 104,471); Feodosiya (Theodosia), a resort, fisheries center, and grain export port (pop. 1926, 28,656); and Yalta, the largest resort (pop. 1926, 28,838). The total Crimean population (1950 est.) is 1,200,000.

History.—The history of the Crimea extends over 24 centuries. In ancient times, Greek seamen founded trading posts on the coast, one of which, Feodosiya, still bears its original Greek name. When Greece was conquered by the Roman Empire, the Crimean settlements fell under Roman rule. As Rome declined, the Crimean ports transferred their allegiance to Byzantium. From the 7th to the 10th centuries, the entire Crimea was ruled by the Khazars, a race similar to the Armenians and Georgians, but Jewish in religion. A civilized people, the Khazars founded small towns, and conducted a large sea trade. By the end of the 10th century, their power was broken by attacking Russians in the north, and the Asian Pechenegs in the south. The Pechenegs, after ruling the Crimea for a century and a half, yielded to another Asian race, the Polovtsi. These in turn were overthrown in the 13th century by the Mongols, the so-called Golden Horde, who incorporated the Crimea in the Mongol Empire. As this empire disintegrated, the Crimea became part of the Mongol realm in Russia.

Meanwhile, Genoese traders founded settlements along the coast. As the Mongol Empire declined before Russian attacks in the late 15th century, the Crimean Tatars (Mongols) declared themselves independent, although the Turkish sultan in 1475 claimed suzerainty over the Crimea. By the 16th century, the Crimea was the only Tatar state left in European Russia. The Crimean Tatars continually fought the Russian czars, even capturing and burning Moscow in 1571. During the next two centuries, the Tatars, both as a semi-independent nation and as Turkish vassals, were a constant thorn in Russia's side. Russian armies, invading the Crimea in the late 17th and early 18th centuries, were

repulsed; and in 1768, the Tatars again invaded Russia. Finally, a peace treaty between Russia and Turkey in 1774 declared the Crimea independent. Soon afterwards, however, in 1783, the Crimea at its own request was annexed to Russia.

In the mid-19th century, the Crimea played a major role in European politics as the main battleground of the Crimean War. After the Bolshevik Revolution in Russia in 1917, the peninsula became the headquarters of White armies fighting the Communists in the Russian civil war. In 1920 the Communist Gen. Frunze reconquered the Crimea in a spectacular campaign still celebrated in the USSR. The Crimea won fame again in World War II, when its naval base Sevastopol withstood a seven months' siege before surrendering to the Wehrmacht. Late in the war (1944), Crimea's Yalta was the site of the famed conference of President Roosevelt, Prime Minister Churchill, and Premier Stalin. The Crimean Tatars betrayed the region to the Germans in wartime, with the result that their autonomous republic was abolished. See also CRIMEAN WAR, THE; FEODOSIYA; KFRCH; KHAZARS; UNION OF SOVIET SOCIALIST REPUBLICS—*Civil War*; WORLD WAR II—*Crimean Campaign and Battle for Kharkov*.

ELLSWORTH RAYMOND,
New York University.

CRIMEA CONFERENCE (YALTA).

See PACTS AND CONFERENCES: WORLD WAR II.

CRIMEAN WAR, The. After Russia's annexation of the Crimea (q.v.) in 1783, it was generally believed by the Western powers of Europe that Russia aimed at the dismemberment of the Ottoman Empire and the conquest of Constantinople (now Istanbul) itself. The Greek insurrection of 1821 had brought the rivalry between Russia and Turkey to a head, and war broke out. The defeat of the Turkish Army led to the Treaty of Adrianople in 1829, which gave Russia some slight gains in territory, but, more important, opened the Dardanelles to the passage of her merchant ships. The Western powers did not interfere at this time, but together with Russia, exerted their influence to win Greece's independence from Turkey in 1832. Russia again forced on Turkey a treaty which not only gave her control of the straits, but established a virtual Russian protectorate over the sultan.

Russian diplomats tried unsuccessfully to win the approval of Great Britain for these gains. England's policy, dictated by the need to protect her Eastern possessions, was the preservation of the Ottoman Empire and the containment of Russia's ambitions. Among other indications of Russia's aggressive tendencies was the great naval arsenal of Sevastopol, occupying the most commanding position in the Black Sea at the extremity of the Crimean Peninsula. Begun by Catherine II in 1786, it was provided to an unlimited extent with all the means then developed for both offensive and defensive warfare. Obviously, it presented a serious menace to Turkey. Emperor Nicholas I, one of the ablest and most ambitious of the czars, satisfied himself that the time to strike was at hand. Russia's aim to destroy the Ottoman Empire was the underlying cause of the Crimean War, and the opportunity presented itself in 1852.

The Sublime Porte (as the Ottoman Empire was called), adjudicating a dispute in February 1852 between the Latin and Greek churches in the empire—the former under the protection of France, the latter of Russia—gave a decision concerning the holy places in Palestine, which was considered favorable to Russia. In November 1852 a new demand was made by Russia based on the Treaty of Kuchuk Kainarji (1774), claiming a protectorate over the Greek Church throughout the Ottoman Empire. After complicated negotiations, the Porte, under pressure from France, reversed its former decision and took the side of the Latins, and on December 22 delivered the key of the church of Bethlehem to the Latin patriarch.

The diplomacy of the powers exhausting itself over the dispute, finally, in May 1853, Russia delivered an ultimatum to the Porte. This being rejected, the Russian Army crossed the Pruth and occupied the Danubian Principalities (July 2). On English advice the Porte refrained from regarding this aggression as an act of war, while the diplomats renewed their efforts to find a peace formula. These ended when the Porte, after expiration of an ultimatum, declared war against Russia on Oct. 4, to which Russia responded on November 1 with a like declaration. Meanwhile, European public opinion had become increasingly hostile to the Russian aims. Two days before Russia's declaration of war French and English fleets had entered the Bosphorus. The war opened auspiciously for Turkey with one or two victories over Russian troops by Omar Pasha; but on November 30 a Russian fleet based on Sevastopol destroyed a Turkish squadron off Sinope in the Black Sea. On Jan. 4, 1854 the French and English fleets entered the Black Sea.

Much as the British disliked and feared Napoleon III of France, they felt obliged to form an alliance with France and Turkey, and the treaty of March 12 resulted. England and France declared war on Russia March 28, and three days later the first troops of the Western Allies, a French corps under Gen. F. C. Canrobert, debarked at Gallipoli. By May some 50,000 French troops under Marshal Armand J. L. de St. Arnaud, and 25,000 British under Lord Raglan (Lord Fitzroy James Henry Somerset), were landed there, and later transported to Varna (now Stalin, Bulgaria) on the Black Sea.

The Crimean War has gone down in the records of history as one of the worst managed, badly led, ill supplied, and unnecessarily wasteful of life, of all modern wars. What won it was the courage of the common soldier. The British Army was badly led and inefficiently managed because its leaders were inexperienced in troop command. Lord Raglan, nearly 70, had been on the staff of the duke of Wellington in the Napoleonic Wars; the duke of Cambridge (George William Frederick Charles) had never been in a battle; the earl of Cardigan (J. T. Brudenell) was equally inexperienced in campaigning; the earl of Lucan (G. C. Bingham) was another elderly general. The French marshal, St. Arnaud, a distinguished soldier, died early in the campaign, and was succeeded by General Canrobert, who was also a veteran. Gen. Patrice de MacMahon, too, was an efficient soldier. However, battle after battle was marked by terrible blunders, on both sides. The famous charge of the Light Brigade was only one of these blunders, best known

largely because it was immortalized in verse by Alfred, Lord Tennyson. The armies were conveyed to the battlefield in overcrowded troopships, cholera was rife throughout the campaign: protection, proper food, and equipment were all lacking.

Students of the campaign have pointed out all the mistakes that were made. In the first place, nothing was known of the Crimean Peninsula where the battles were to take place. In September 1854 the combined fleets of Great Britain and France convoyed troopships which transported from Varna the mightiest army ever conveyed by sea, to the west coast of the Crimea, about 30 miles north of Sevastopol. Disembarkation of most of the troops was completed on the 16th, and the allied forces began to move southward on the 19th, the French approaching the banks of the Alma River on the right, the British on the left, early on the 20th. They found the Russian Army occupying a position which Prince A. D. Menshikov, its commander, believed impregnable. A small French force made its way up the cliffs where the river ran into the sea, and surprised Menshikov, but failed to advance. To save the situation, the British were forced to attack from across the river, and scale the heights under direct fire from the Russian guns, suffering terrible casualties in two separate assaults, but finally routing the Russians. Had the Allies followed up this advantage by attacking Sevastopol at once, it is probable they would have succeeded, but in a blunder that was typical of the campaign, they did not pursue the fleeing Russian Army.

Having determined to besiege Sevastopol, the Allies chose the worst plan of attack, making a difficult and costly march over waterless territory to the south of the port, taking no advantage of the fact that it was undefended to the north. The Russians were never cut off from the mainland and their sources of supply. In fact during the siege of Sevastopol the besieged were better off in every way than the besiegers.

These mistakes culminated in the Battle of Balaklava (October 25). Lord Raglan, who was watching the battle from the heights whence he could see the valleys and ridges clearly, sent a vague message to the cavalry commanded by Lord Lucan, who in his position could not see the Russian guns Raglan meant him to attack, but only those at the head of the valley commanding the entire field below. Instead of investigating the situation Lucan gave orders to Lord Cardigan, commanding the Light Brigade, to lead a charge, which his Heavy Brigade would support. Nearly 700 cavalymen charged straight into the Russian guns; only 195 returned.

On November 5 was fought the Battle of Inkerman, in which a powerful Russian assault on the British camp was repulsed. Both England and France at last became alive to the magnitude of the struggle. While the siege of Sevastopol continued, other important positions in the Crimea were occupied, seriously threatening the communications of the Russians and making it possible to destroy some of their supplies. At an early period the Russians, by sinking a number of ships across the mouth of Sevastopol's harbor, had protected themselves from an attack by sea.

On Jan. 2, 1855, Sardinia (Piedmont) under the leadership of Count Camillo Benso di Cavour, formed an alliance with the Allies, and sent a force of 10,000 men under Gen. Alfonso La Marmora to the Crimea. They arrived May 8, 1855.

Canrobert resigned his command after quarreling with Lord Raglan, and was succeeded by A. J. J. Pélissier on May 19.

Sevastopol was finally stormed on June 18, 1855, but this attack failed. Lord Raglan died and was succeeded by Gen. James Simpson. On September 8 the Malakoff tower was stormed by the French under Pélissier, after the British attack on the Redan had failed. General MacMahon, in command of the Zouaves, refused to be driven out of the tower when Russian reinforcements arrived. "*J'y suis, j'y reste!*" was his famous declaration. This assault led to the abandonment by the Russians of Sevastopol. The siege had lasted 11 months.

The Treaty of Paris, concluded on March 30, 1856, guaranteed the independence of the Ottoman Empire and granted her admission to the society (concert) of European powers declared by the other contracting parties: Great Britain, Austria, France, Prussia, Piedmont (Sardinia), and Russia. The Christians in Turkey were to remain under the protection of the sultan, who by a royal order allowed them religious liberty; Russia renounced her protectorate over the Danubian Principalities; the Black Sea was neutralized; the navigation of the Danube was to be free to all nations. The participation of Piedmont was a step toward the unification of Italy later; Austria and Prussia made a defensive alliance against Russia, effectively checking any move she might make west of the Balkans; and Turkey was assured no further attempt would be made by Russia against her territories.

The total casualties in the Crimean War have been estimated at half a million, but out of the sufferings of the men in the Crimean War some good did come. The status and conditions of service for the soldier were bettered; more training for the officers of the British armies was instituted, and later staff colleges were established in Great Britain, on the Continent, and eventually in the United States; commissariat and supply functions of all kinds were improved; and best of all, medical and hospital services were completely reformed. Under the leadership of Florence Nightingale (q.v.), whom the historian G. M. Trevelyan calls "the real hero of the war," army hospitals and army nurses came into existence.

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CRIMINAL CONVERSATION is a tort consisting of adulterous intercourse between the defendant and the spouse of the plaintiff. It is similar to alienation of affections, but is distinguishable from it in that the latter may, but does not necessarily, involve adultery (q.v.).

CRIMINAL LAW. Through time, criminal law, like its primitive antecedents, has consisted in whatever complex of institutional patterns existed in a given society for coping with behavior experienced by a significant number of politically significant individuals as seriously threatening to the value system (preferred form

of social order) of the society in question; and the term "criminal" has for many centuries in its various linguistic forms throughout the world been employed to stigmatize persons so experienced.

The element of stigmatization is important to the definition for a variety of reasons: (1) it affords a ritual opportunity for re-affirmation of the preferred value system; (2) it breaks identification with the person in question as an individual, thus affording an opportunity for the venting of aggressions generated in conforming members of the community by the frustrations that their conformity may have engendered; and, (3) it differentiates the low men on the social totem pole from the "madmen," who were recognized, in their more extreme manic and schizophrenic manifestations at least, even in cultures long antedating the development of modern psychiatry, as somehow more tolerable or less dangerous than the criminal. All existing systems of law similarly continue to distinguish between the "insane" (seriously mentally ill or defective) offender and others.

Criminal law today comprises an increasingly vast body of prescriptions promulgated and interpreted by duly constituted authorities in every geopolitical unit of the world, backed by the collective force of the community in question, and governing the infliction of relatively severe negative sanctions on persons whose behavior deviates in a threatening way from the preferred values and institutional patterns. The form and content of criminal law thus differ from community to community, but the common factors are those indicated above. Existing jurisprudential systems differ in terms of their cultural derivations—notably Anglo-North American, Western European, Spanish-South American, Moslem, Hindu, Confucian, and Soviet; and they differ in terms of the amount and degree of counter-mores violence expected.

Where tension is high and the possibility of revolution or counterrevolution is ever present in the calculations of policy makers and administrators, the law tends to be relatively harsh, and the discretionary powers of the military, police, and the prosecuting authorities relatively large and subject to a minimum of judicial supervision. Where tension is low and only common crime as distinguished from revolution or invasion is contemplated, prescriptions tend to be moderated, limited, and subject to stringent judicial supervision.

Criminal law is not, of course, the only branch of modern law dealing with the infliction of negative sanctions. All law ultimately depends on a probability that it will be invoked where relevant situations arise, and that authoritative decisions rendered pursuant thereto will be obeyed or enforced. In this sense the provisions of every known system of criminal law dealing with challenges to authority generally and "contempts" in particular may be regarded as underpinnings of all the other branches of law. Criminal sanctions are also often prescribed as alternative measures in laws setting up schemes of administrative regulation which include as well an array of "civil" and "equitable" measures of enforcement. In such cases the criminal law functions as a secondary sanction.

But the unique feature of criminal law and its primitive antecedents through time has consisted in its institutional function of coping with the

elemental uncivilized threats to local peace and order short of resort to martial rule or individual self-help. Here criminal law operates as a primary sanction. In this respect the historic role of criminal law is analogous to the hoped-for role of a future international law in coping with elemental threats to peace and order on the scale of a world community; and the gradual establishment of "the peace" within local communities, with a corresponding limitation of the permissible use of force and arms, is analogous to the international problem of limiting national resort to force.

What distinguishes the criminal law from other types of regulatory law, and the forms of deviational behavior, which are its primary concern, from those primarily entrusted to other forms of legal or purely social sanctioning? The fact is that there have been many developments in modern law which render the distinction between criminal and certain "preventive" civil proceedings increasingly technical.

Some examples from the United States of sanctions, which are in fact of a severe negative character but technically not classed as "criminal," would include the denaturalization of naturalized citizens found by a civil court to have misrepresented their allegiance, the stigmatizing and exclusion from public employ and participation in various other phases of the life of the community of persons whose loyalty is administratively found to be suspect, proceedings under the antitrust laws wherein such "equitable" relief as dissolution, divorcement, and divestiture is sought by the government, and many others in the licensing field. Under recent legislation in a number of American jurisdictions one may today be committed for an indefinite period to a penal institution or hospital on diagnosis and adjudication as a "psychopathic sex offender"—and this despite the fact that he may thus far have committed no offense for which he could be imprisoned for more than a short term or, under some of the statutes, no offense at all. Such statutes represent an extension of the sort of preventive and welfare concepts on which more familiar procedures such as the civil commitment of the mentally ill or defective, the quarantine of the carriers of contagious diseases, and the juvenile court commitment of delinquent and neglected children, are based.

On a few occasions when American courts detected a punitive purpose in legislative action purporting to be nonpenal, they have overruled the legislatures for failure to conform to the constitutional standards set for criminal prosecution. There was the case of *Wong Wing* in 1896 (163 U.S. 228), wherein the Supreme Court held that a provision in the immigration law that deportable Chinese aliens be imprisoned at hard labor as an incident to deportation was invalid as an attempt to impose an infamous punishment without benefit of the usual criminal procedure for the ascertainment of guilt. There was the *Lovett case* in 1946 (328 U.S. 303), wherein the Supreme Court struck down as a "bill of attainder" a provision in an appropriation act that "no salary or compensation shall be paid" three named employees in the executive branch whose loyalty was questioned in Congress "out of any monies now or hereafter appropriated." The Supreme Court has also recognized that the issue and sanction involved in a civil proceeding may be of such gravity, as in the

Knauer case in 1946 (328 U.S. 654), as to impose on the government an exceptional burden of proof—namely, “clear, unequivocal, and convincing” evidence which does not “leave the issue in doubt.” This was a proceeding to cancel a certificate of naturalization obtained by fraudulent oath and statements of allegiance in 1936 and 1937.

Apart from these technically “civil” proceedings and sanctions, what of the many private groups and organizations which in fact wield more or less unchallenged coercive power over individuals? Some of these are areal in their makeup and some are lateral—that is, not based on or confined to a particular geographical area. Examples of these exist in every country and will readily occur to anyone. Guild socialism and proposals for the corporative state have stemmed in part from recognition of this phenomenon, as have many of the American anti-trust laws.

Where such *de facto* aggregated power is exercised by a private group one may take it that government either tolerates or has failed to break up or to regulate such sanctioning power, since the power to coerce others is supposed to be a monopoly of government, exercised only pursuant to law. Such sanctioning activities are, moreover, social phenomena, as distinguished from the deprivations which one individual acting on his own and using only his own resources may inflict on another. Functionally speaking, and for purposes of cross-cultural comparison, it appears that we need operational criteria for the “criminal” or “penal” as distinguished from the legal and social sanctions unless, like the pure positivist in jurisprudence, we are content with local form and local formal designation.

Primitive Law.—Primitive law, being less differentiated, did not raise these problems. Given a community with a minimum of formal governmental organization, regulations take the form of customs and taboos. Out of these, as they become intellectually rationalized in terms of some more or less articulate philosophy, institutions develop. Formally enacted institutions, as found in contemporary law, are products of high civilization. The earliest known ancient written codes of law (such as those of Lipit-Ishtar and Hammurabi) were rigidly penal in form.

In primitive custom the community as a whole did not greatly concern itself with the redress of private wrongs, injured individuals and their kinsmen being left to get what satisfaction they could through private retaliation. The earliest English form of criminal procedure was simply regulative of the right of summary execution accorded one who caught a wrongdoer on his premises in *flagrante delicto*. A thief was permitted to reclaim his life by paying *wer*, and could take sanctuary in various places such as a church or the demesne of the king, a bishop, or a lord. The idea that wrongdoing might injure not merely an individual victim but also a community as a whole was not grasped until later times. During most of the Saxon period in English history crimes continued to be regarded as acts of war, and blood feuds and private warfare were normal features of society. Community authority and its prescriptions were concerned with reconciliation of antagonists upon established terms rather than with the putting down of violence by legal process. The conception of the “King’s Peace” as a condition opposed

to private war began to gain currency in the time of Alfred (849–899 A.D.).

The foundations of the later English system were early laid, however, by laws ordering the local organization of the country by shires, hundreds, and parishes, for policing purposes. Men were required to combine in associations of 10, each being a surety for the good behavior of the rest, to produce any of the rest charged with an offense or, in the alternative, to make restitution. This was the “frank-pledge.” The hundred courts and county courts corresponded with the local police organization, in criminal matters the sheriff’s “tourn” being the county court held for a particular hundred. Guilt or innocence were originally determined in the county court by compurgation, or by ordeal if the accused was not “oath-worthy.”

Under William the Conqueror (r. 1066–1087) and his immediate successors the supervisory powers of the King’s Court were greatly increased and its concurrent jurisdiction exercised more frequently until the King’s Assizes practically displaced the county court in important criminal jurisdiction. Criminal actions up to the time of Edward I (r. 1272–1307) were instituted by “appeals” to the county courts and proceeded on private initiative rather than action by the crown. In form such an appeal was a wager of combat, each party undertaking to “prove by his body” the justice of his cause. But it was left to the viscount and coroners to determine whether the appellee “ought to have the country,” meaning an inquisition by the judicial committee of the court (precursor of the jury) and a determination of the facts on the oaths or (later) the testimony of witnesses.

Neither the ancient laws decreed by kings nor the earlier acts of legislatures yield much in the way of abstract definitions of crimes. Their provisions typically assume knowledge on the part of officers as to what distinguishes a public offense from a civil trespass. From the forms of appeals given by Henry de Bracton (d. 1268) in his *Leges Anglorum*, it does appear that the idea of a crime being an infraction of public order as well as an invasion of private right had become accepted. The appellant was required to allege that at the time in question he was “in the peace of the lord king,” that the defendant “came with his force against the peace,” in felony and in “premeditated assault.”

Criminal Sanctions Forms.—The forms of criminal sanctions which have been employed at one time or another cover the entire range of ways which might be imagined to punish, incapacitate, deter, or reform culprits. The major forms may be grouped as follows: (a) subjection to open condemnation or ridicule; (b) partial exclusion, permanent or temporary, from participation in the life of the community, as through loss of civil or religious rights, rank, or privileges; (c) deprivation of property, as through fine or forfeiture, seizure, or destruction; (d) infliction of bodily pain; (e) mutilation where pain is incidental to incapacitation or exposure to reprobation; (f) permanent exclusion from the community, as by banishment or exile; (g) imprisonment; and (h) death. Imprisonment (save for pretrial detention) came in late. Mutilation is no longer authorized by most contemporary criminal codes. Torture is universally eschewed in contemporary legal codes, though not altogether eradicated from police practice and war-

time intelligence techniques. The death penalty and any social justification thereof are being increasingly questioned, an impressive number of highly civilized communities having already abolished it with no demonstrable loss of general deterrence.

Substantive Criminal Law.—Substantive criminal law is variously expressed: there are the "code" traditions and the "common law" or "folk law" traditions; and there are the bodies of law supposed to be rigidly construed in accord with the western European "principle of legality" or the Anglo-American principle of "strict construction," and those supposed (like the Nazi and Soviet types) to be subject to the "principle of analogy." But these differences in concept and fashion seem to be reduced through practice and time. The European codes, originally designed as comprehensive and internally coherent expressions of an explicit penal philosophy, have lost much of this character through the accretion of amendments reflecting new orientations and the pressures of new problems, without benefit of continuing periodic over-all revision. The old common law of crime in England and the United States no longer exists, thanks to the accretion of legislation, compilation, and occasional codification.

The important substantive differences between systems of criminal law today, apart from the divergent schemes of values from which they stem, consist in the extent to which they tolerate administrative policing and negative sanctioning of supposed deviates unsupervised by the authorities charged with the administration of the formal or codified criminal law. In this respect the Soviet-type codes appear to be more limited in their coverage than the others—applicable, apparently, only to offenses and offenders not regarded by elite group members as seriously threatening to themselves or the regime.

Criminal Procedure.—Two major systems in criminal procedure compete today—the "inquisitorial" (as exemplified by the 18th and 19th century European codes, and the Soviet-type codes which in this respect are patterned on them), and the "adversary-accusatorial" (as exemplified by the basic Anglo-American common law procedure). They involve different conceptions of the appropriate roles in the criminal proceeding of the defendant and the victim, of the police, of defense counsel and the prosecuting attorney, and of the court.

Inquisitorial Systems.—Under the inquisitorial systems the court and its adjuncts (the examining magistrate and the public prosecutor) exercise full control of the preliminary investigation and of the presentation of the case at trial; the offender, once formally accused, is a central party in the investigation in the sense that he and his counsel are entitled to see all statements of witnesses and exhibits amassed by the police and the examining magistrate, and to suggest further leads to be investigated; the victim is a full party in the sense that he may intervene with counsel as "partie civile" in the pretrial investigation, and at the trial, and have his claims to civil relief arising out of the crime adjudicated in the criminal proceeding; and the court exercises an affirmative rather than umpire role in the conduct of the proceeding.

Adversary-Accusatorial Systems.—Under the accusatorial systems the defendant (and his counsel, if any) are outside the preliminary investiga-

tion, and have little right to any disclosure in advance of the prosecution's evidence; at trial the court functions more as an umpire, leaving the presentation of the official case to the prosecuting attorney and the responsibility of presenting whatever evidence should be presented on behalf of the accused (and the cross-examination of prosecuting witnesses) to the defendant and his counsel. The practice in the United States presents the extreme contrast with other systems in this respect—and here even diverges from the contemporary English. The American system is marked by a minimum of pretrial disclosure of evidence to the accused, and a maximum latitude and obligation imposed on defense counsel to make his own pretrial investigation and himself interview all witnesses.

Trends.—Major global trends in criminal law are fairly clear. In any given geopolitical unit the exceptions to the criminal law's jurisdiction in favor of relatively arbitrary or nonjudicially supervised police measures tend to enlarge or contract depending on rise and fall in the expectation of violence. The preference for coherent systematic codification as against uncompiled and unrationalized accretion of particular statutes and decisions gains ground. The "underdeveloped" or hitherto "low culture" areas of the world are adopting new codes patterned on those of the industrialized or "high culture" nations which happen to be influential in the area in question. There is decreasing resort, where the ordinary run of nonprofessional and situational offenders are concerned, to sentences of imprisonment exceeding five years or involving commitment to maximum security institutions, but an increasing inclination to devise procedures for the early detection of the small "hard core" of chronically antisocial and dangerous (or psychopathic) offenders, and to provide for their indefinite detention in specialized maximum security institutions. The inutility of the local or county jail sentence of a year or less involving primarily idle detention is generally recognized, as is the necessity for productive and vocationally oriented work or other participation in group activities on the part of all persons in custody if they are not to deteriorate.

In the matter of sentencing there is growing recognition that the courts need the help of diagnostic clinics. Probation and parole, like the partially indeterminate rather than fixed sentence, have been assimilated into most contemporary systems, as have special juvenile courts with nonpenal procedures for persons under 16 or 18, and in some cases for youths under 21. Systems of periodic furlough of prisoners classed as minimum security risks are also successfully employed in some of the Latin systems to preserve family ties and to bridge the gap between custody and release on parole.

New and relatively new penal codes of special interest to the comparative scholar include those of Switzerland, Mexico, Yugoslavia, Cyprus, Louisiana, South Korea, the USSR and a number of South American countries. In the realm of procedure, the Federal Rules promulgated by the U.S. Supreme Court in 1946 and those promulgated in New Jersey in 1953 represent the most advanced models in the United States.

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GEORGE H. DESSION,

Lines Professor of Law, Yale University Law School.

CRIMINAL SOCIETIES. Criminals, typically, are not social beings. Their tendency is to act alone. Only when circumstances dictate do they acquire partners or join a gang; and, since they are usually undisciplined, maladjusted persons, generally neither the partnership nor the gang membership outlives the temporary necessity which brought it into being. The study therefore of enduring criminal societies, gangs, or other groupings is particularly interesting to the sociologist. However, it must be approached with caution, lest we read into the history of certain organizations which have come to be known as "criminal societies" a wholly criminal motivation, or, on the other hand, confuse gangs of known criminals, assembled briefly under a leader for the commission of a single crime or even for a series of depredations, with the formally organized, well-regulated, truly criminal society. The latter is in most instances racially, nationally, and socially homogeneous, and its activities may extend over a period of several generations, even of several centuries. And we must take care, too, to define "criminal," for, as we shall see, what is "criminal" to one unit of society may well be "patriotism" or "social justice" to another.

The society, fanatically devoted to the achievement of national independence, which attempts to throw off the yoke of the foreign occupier by assassinating his local administrators and terrorizing his transplanted colonists; which finances its revolutionary activities by robbing banks and the payrolls of the invader's commercial enterprises, and which violates openly and contemptuously the laws and regulations of what might be not only the *de facto* but, in the eyes of the world, the *de jure*, government, is a "criminal society" to the occupying government, but a band

of patriots to the people. There is perhaps some relationship between means and end. Does the end justify the means? History makes clear that the use of illegal or criminal means for the attainment of what might be defined as a "good" end has often subtly reshaped or redefined that goal, or diverted the attention and energies of those using the criminal means until the criminality of both means and ends was indistinguishable.

Criminal societies of one type or another have been identified in the history of every people, every nation, and every region. In certain areas they were early brought under control while in other parts of the world they flourished; and in some few localities they are still troublesome. Many of the problems connected with the understanding of these organized flouters of societal regulations may become less difficult if we begin by examining the conditions which seemingly favored the development of criminal societies in the past.

Analysis of the histories of the more prominent criminal societies indicates that the confusions, chaos, social and economic dislocations resulting from wars, and some methods of fighting wars, provide a fertile spawning ground not only for criminality *per se* but specifically for organized crime. Without discussing the sociological and psychological implications of family disorganization, destruction of property, and habituation to violence, it is well established that a number of the criminal associations of past epochs resulted from postwar activities of: (a) guerrilla bands or other irregular troops, organized and supplied by the regular forces, or living off the countryside, but not subjected to the control and discipline of the regular services; (b) underground movements ("fifth column") which behind the enemy lines or within occupied territory clandestinely carried on a harrying warfare; and (c) sea raiders who, under letters of marque and reprisal, preyed upon enemy commerce.

One of the major conditions favoring the growth of criminal societies is foreign occupation or enslavement. Secret societies with national aspirations flourish even when no active revolutionary movement is in existence, criminal methods are employed, and all too often the national aspiration becomes only a cloak for the continuance of a profitable, organized criminality, preying alike on the invader and the native, and giving the independence movement a bad name among the peoples of the world. And since violence often incites counterviolence, secret, terroristic societies of a counterrevolutionary character sometimes spring up in opposition and there ensues a veritable state of war, with outrage countering outrage.

Similar acts of violence can be the response to home tyranny, too, as was clearly evidenced in the Russia of the czars. But even more favorable to the flowering of organized criminal groupings are weak, corrupt, and inefficient governments. All nations have had their criminal societies at one time or another during their national development, but those countries which developed sound governments, placed the administration of justice on a high plane, organized efficient police units, and secured the voluntary cooperation of the people or warred so successfully against criminal gangs as to demonstrate the futility of such activity, rid themselves of this threat to their sovereignty at an early stage in their national evolution. The persistence and power of these societies

in certain other areas can be attributed in large part to intrinsic weaknesses in the governmental structure (for example, disunited Italy), to lack of public morality (wholesale corruption accepted as inevitable), or to inefficiency of the operating arms of the government, particularly the police—due to poor selection and training, low pay, and concealed sympathies with the criminal elements.

No criminal society can long exist without a reserve of popular support and cooperation. Joseph Gollomb, describing the funeral of Nonce Romanetti, the Corsican bandit leader, in 1927, wrote: "Then came mourners on foot, the poor. There were thousands of them. They plodded along with an air of having lost someone dear . . . Some of the women wept. [To the] simple-minded peasantry . . . Romanetti was now a hero, a crusader, a friend of the poor, the terror of the wicked rich." Whence comes this popular support? It is easily understandable in those instances in which the criminality is cloaked by patriotic motives; only somewhat less so when the banditti follow the Robin Hood pattern and divide their loot with the poor and downtrodden of the locality, albeit withholding the major portion. But we have also known instances in 20th century America involving criminal gangs which murdered, looted, and flouted the laws with no pretension to political or philanthropic motivation, yet evoked popular support and sympathy to such an extent that police action against them was inhibited, and their political patrons were continued in or returned to office. The calm acceptance by the people of the city of New York of the oft-demonstrated organized criminality on its waterfront and of the repeated exposures of alliances between its police and organized gambling syndicates, indicates a degree of tolerance of organized criminal activity not found in many civilized communities.

Certain reactions of society to organized groups (political, social, religious), as well as certain types of punishments to individuals, have at times resulted in the formation of criminal societies. Outlawry as a punishment is seldom encountered today, but was frequently employed in the past. A form of outlawry that might be termed societal ostracism is sometimes visited upon peoples and groups which, for one or another reason—not always criminal and not always involving fault—have offended the dominant groups in a community. Thus India at one time drove forth its lepers to live by stealing or other crimes, while various small American communities today banish their ex-convicts and other undesirable citizens, who gravitate to the larger seaport cities and, denied work or status, drift into criminal activities and criminal societies. From 1788 through 1840, the British government sent to penal servitude in Australia some 82,290 convicts—many of them political offenders. Their sentences amounted to slave labor on either private or public works, and brutal treatment drove thousands to escape into the "bush," where they formed gangs specializing in rustling and highway robbery and became known to the public as "bushrangers." They "robbed the rich and helped the poor, and never harmed a lady," and cemented for themselves a solid niche in Australian folklore. It was not until the 1880's that the authorities finally rid the territory of the bushrangers. A similar situation has existed in the areas surrounding other penal colonies, notably the Guianas in South America, where escapees and

expired-sentence men from the French penal settlements often engaged in organized criminality.

The Dutch criminologist W. A. Bongers and the Italian Enrico Ferri have pointed out the relationship between economic conditions and criminality. The persistence of the Robin Hood legend in all parts of the world, the popular support of criminal societies in many areas (or the apathy of the public toward efforts to suppress them), and the personal popularity of the leaders of criminal groups among hardworking, honest, devout people, can be partially explained by the frictions engendered in a society economically so organized that great wealth is ostentatiously displayed by the few against a background of dire poverty among the many. In countries or localities where there is no substantial middle class to fill the role of an ameliorative buffer between rich and poor, the criminal society is apt to flourish, posing as defender of the downtrodden and making a show of equalizing the distribution of property by robbing the rich to give to the poor.

Organized criminality, usually of a minor but irritating nature, has been long ascribed to roving groups such as gypsies, tinkers, and desert nomads. No adequate study of these groups is available. They have been charged with such offenses as begging, fortune-telling, prostitution, gambling, disorderly acts, petty larcenies, and horse stealing, but have rarely been convicted of major crimes involving organized groupings under central direction. Many crimes have been charged to them simply because they are different, foreign, or because, having passed through to another area, they provide a convenient scapegoat for police inability to track down the real criminals.

Categories.—Criminal societies may be treated under five basic categories: (a) communities, tribes, or nations primarily devoted to criminal pursuits, such as the Dacots of India; (b) formal societies, with a name, officers, written or unwritten codes, organized either for criminal purposes, or using criminal methods to attain a non-criminal end, or a patriotic or other noncriminal aim to mask really criminal motivations, as the Mafia of Sicily; (c) informal or casual groupings of persons in the criminal classes occasionally but not always recognizing a common leader and giving obedience to a common but ill-defined code, as the Apaches of Paris; (d) gangs organized for a specific crime or series of crimes which seldom outlive the accomplishment of a limited objective or the death or arrest of the leader; and (e) members of primitive or aboriginal cultures with patterns of conduct not acceptable to civilized peoples, for example, the Moros of the Sulu Archipelago, Philippines, or, better, the headhunters of Africa and South America.

Specific criminal societies may be classifiable under more than one category. Thus the Mau Mau of Kenya are a formal group, nationalistic in aims and terroristic in methods, but representative of a primitive cultural pattern basically at odds with the war-making methods of more "civilized" peoples.

Occasionally, too, examples have been observed of religious fanaticism leading to organized conduct which could only be described as criminality (flagellantes, Skoptsy, etc.)—and in certain historical instances the entire conduct of a legitimate government has been such as to indict it before the bar of world opinion as criminal, for example, Hitler's genocidal campaign against the Jews. It is almost axiomatic that a wholly anarchic

organization could not long exist; hence, within each category will be found conduct restrictions, formal or understood, requiring members to observe certain principles in dealing with other members. At times these intraorganizational laws are more restrictive than those promulgated by society for its own protection. Whether these codes are rigidly observed, or as regularly breached as are society's laws, varies among criminal groups and also within each group from time to time, depending on strength of leadership, outside hostile forces, and other factors.

Origin and History.—The origin and history of the criminal societies of the past are cloaked in antiquity and legend. Indeed, the past records of many present criminal societies have been deliberately obscured to such an extent that few incontrovertible statements may be made concerning these groups. The available sources—legends, folklore, ballads, memoirs of the more literate or exhibitionistic of their members or of the enforcement officers who fought them—do not commend themselves to the historiographer. Nor are court records of much value, the intricacies of the rules of evidence and the code of *omerta* (silence) combining to minimize the amount of testimony relating to the organizations and their operations. Even among members and leaders of existing criminal fraternities there is continuing dispute as to origin, purpose, relationship to other movements, meaning of cabalistic designs and codes, and interpretation of oaths, derivation of names, and translation of argot.

Italy.—The laboratory for the study of criminal societies is the Italian peninsula and its adjacent islands; for it is in that area that they have flowered in greatest numbers, achieved the most spectacular powers, and proved most long-lived. The less well-known societies, the Barabas, the Carbonari, the Tepisti, the Bulli, the Magnaccia, and the Malavita, and to a somewhat lesser extent the maquis-banditti of Corsica, are mentioned occasionally in the literature and until recent times were quite troublesome to the Italian police. Two of Italy's criminal fraternities have, however, more than local fame and merit special study, namely, the Mafia and the Camorra.

Camorra.—The Camorra of Naples has been studied by Cesare Lombroso, Salvatore Ottolenghi, Melville D. Post, and others. It is the most truly criminal among the societies to be examined, having been founded (perhaps by Antonio Giaperelli) in the prisons of early 19th century Naples for the cooperative and systematic robbing of all new prisoners. Ex-convicts on their release organized similar societies to prey on merchants (the protection racket in much the same *modus operandi* as we know it today), to blackmail, and to collect tribute under threat of death from the rich, from other criminals, and even from government officials. For more than fifty years the Camorra scoured the Italian peninsula, centering its activities in Naples, but extending its fangs to the northern cities and to the Adriatic shores. Its chief was the *Macstro*; its recruits were carefully tested and accepted as acolytes only after having proved themselves fitted by at least one assassination; its earnings were divided under a community principle with its two grand divisions, *l'alta* and *la bassa*, sharing unevenly.

After the unification of Italy in the 1870's attempts were made to suppress the Camorra, and much of its strength was sapped by aggressive

governmental action which resulted in the arrest and execution or long prison terms for hundreds of its leaders and members. During the Fascist regime in the 1920's and 1930's new suppressive attempts were made when it was discovered that the Camorra still controlled begging, gambling, prostitution, and organized pilfering from the docks of Naples. Some claim that a *modus vivendi* between the Camorra and the Fascist government was arranged at this time. When the writer of this article was chief of the Allied vice squad in Naples as late as 1944, elements claiming Camorrist affiliation or descent, and using Camorrist signs, were active in all fields of organized crime—although they apparently were not tightly organized, engaged in internecine strife, and did not recognize a common *maestro*.

Mafia.—The Mafia of Sicily is older and more distinguished in its origins and its membership than the Camorra. Ed Reid asserts its name comes from its supposed slogan, *Mazzini autorizza furti, incendi, avvelenamenti* (Mazzini authorizes stealing, burning, poisoning), but Post and others think the name was adopted from a race track near Trapani. The Mafia differs in several respects from the Camorra: it was originally non-criminal; it had strong public support especially in Sicily; its membership numbered many distinguished persons including nobles, army and police officials, priests, and landowners; and at least until 1870 it claimed to be the legitimate, if invisible, government of Sicily. Its chiefs were *bravi* and its members *mafiosi*.

Despite its claims to legitimacy and non-criminal membership, the Mafia's record is red with brutal nonpolitical crimes—thefts, robbery, brigandage, extortion—while its political influence was open to sale. It used dramatic methods to maintain its power among the simple islanders, popularizing the *mano nera* (black hand) as a sign of its vengeance and imposing the code of *omerta* (silence) not only on its members but on all who had any knowledge of its activities.

The use of the *mano nera* has long been common among Corsican, Italian, Sardinian, Montenegrin, and other South European criminals, but this does not mean that American authorities in the 1950's are confronted by branches of this great criminal organization, or that its enrolled members have appeared in all places where the black hand has been used for extortion or other criminal purposes. The fear that the Mafia and Camorra have transferred their activities to the United States and have organized and syndicated crime in the larger American cities is ill-founded. Some Italian criminals have settled in America and in many instances have found it profitable to use Italian criminal methods or symbols in preying on their fellow immigrants or on other groups; but it has never been demonstrated that there is any organizational connection between such immigrant criminals and the Mafia. In many cases native Italians who grew up and committed crimes in the United States, when deported to Sicily or Naples have had to resort to farming or stevedoring to earn a living, as they were not accepted by the organized criminal monopolies in the land of their birth.

France.—France has produced several criminal societies of a still different pattern—the Coquilles, the Nervi, and the Apaches. The first one flourished in medieval France and was seemingly a loose association of all the undesirables of the country (beggars, prostitutes, pickpockets,

thieves) with an internal social hierarchy, a special patois, recognition marks (tattoos and scars), and an unwritten code enforced by murder, branding and maiming. It was with this group that the poet François Villon (q.v.) temporarily allied himself, and it is from their activities that writers through the past several hundred years have found inspiration for opera, fiction, and ballads.

The Nervi of Marseille were identifiable by a small tattoo mark on the outer corner of the left eye. More formally organized and narrower in their specialties than most criminal fraternities in France, they infested the waterfront, controlled thievery of all sorts, and levied tribute on prostitutes. They had no fixed rules, often splintered into warring subgroups, but presented a closed front to the police and the public when any of their members were endangered. As late as 1950 gangs of the Marseille waterfront claimed Nervi membership, but responsible police leaders feel that the organization has died.

The Paris Apaches are not an organized criminal society but rather a loose confederation of individuals and groups engaged in a wide variety of antisocial occupations. Various writers have indicated a degree of internal discipline and control not borne out by the available records. Post, for example, quoting an unnamed commissioner of the Paris police, claims that the king of the Apaches "was a lineal descendant of the old royal family of France, who, in spite of every republican effort, still remained king in a certain circle of Paris." Others have attributed Apache leadership to the fabulous "Monsieur Vidocq," but the most reasonable interpretation of the term "apache" is as a generic name for lawbreakers not unlike the terms "hooligan" or "hoodlum." A small criminal fraternity, specializing in church robberies, though whether from anticlerical or mere profit motivations is unknown, has been identified in northern France under the name of the White Wolves, but little of its history or its organization has been ascertained.

Still other French criminal organizations are encountered in the literature. The *Habits-Noirs* of Paris were probably nothing more than a local Apache gang; but the Thiberts purportedly numbered some 800 criminals functioning smoothly under a single director and engaging in every variety of criminality when they were finally disbanded in the middle of the 19th century. The Lamaire band was a short-lived local gang interesting only because its membership was made up of seemingly harmless folk, respectable men and women, who murdered and robbed under the leadership of one Hippolyte Villet. The Catusse-Menegant, functioning in Paris and other large European cities in the late decades of the 19th century, was led by the notorious Chambon (Victor Chevalier) and was enormously successful in organizing bands of pickpockets, shoplifters, fences, burglars and swindlers. It maintained its own London bank through which it disposed of stolen, swindled, or extorted stocks and bonds and its huge revenues of silver and gold.

The professionalization of policing in France under the leadership of the Sureté and the centralization of criminal investigating have had a restraining effect on the operations of such widespread and powerful criminal societies. But the chaotic economic, social, and governmental conditions growing out of the disasters suffered by France in the two World Wars and the instability

of postwar governments gave impetus to new attempts at organized criminality which, as recently as 1951, caused much concern to those charged with police responsibilities and to the victimized merchants of Paris.

Ireland.—The Rapparees of Ireland flourished for more than 300 years from the 16th through the early 19th centuries. Originally members of the dispossessed clans, brothers and kin to the Wild Geese, they had fought for Ireland through the Elizabethan and Cromwellian wars and had been hopelessly impoverished by the seizure of their estates, while their lives had been made forfeit through ban of outlawry. Organizing their kinsmen and retainers into bands, they took to the hills and bogs and woods of their native districts, and lived adventurously by swooping down on the planters and carrying off their cattle and horses. Their sons and grandsons followed the same lawless life, taking heavy toll of the lives and properties of the English and Scotch usurpers. Popular with the local inhabitants for their attacks on the landlord class and for their division of spoils with the poor, they were sheltered when hard-pressed and warned when danger was ahead. A number of rapparees, violating the usual pattern, resorted to common criminality and victimized the Irish and the invader indiscriminately, until eventually public sympathy turned against them. With the organization of the Royal Irish Constabulary in 1787 and the preoccupation of the anti-British elements with the formal revolutionary movements (Fenian Brotherhood, Young Ireland, and later, Sinn Féin), the rapparee bands were relentlessly tracked down and the "men of the hill" eliminated.

Israel, Kenya.—The Stern Gang in Israel provides an example of the short-lived, formally organized, nationalistic or revolutionary terroristic group which, to the government in power, and indeed to some of its opponents, is a criminal society—but which, because of its noncriminal aim and because of its basic support among a large segment of its people, resists such classification. However, had the Stern Gang continued its existence and operations after the birth of the Republic of Israel and changed the focus of its activity to the private enrichment of its membership, as have so many such groupings in the past, then it would be a truly criminal society.

Nor can we at present categorize as criminal the Mau Mau of the Kikuyu tribe in Kenya, the "Hidden Ones," whose objective is to force the white man to leave Kenya and whose methods include butchery, kidnappings, robberies, and other acts of criminal terrorism—killing livestock, arson, extortion. Perhaps the Mau Mau is merely capitalizing on the social unrest and nationalistic spirit that exists in Kenya and the rest of Africa; perhaps if Kenya's conditions are ameliorated and the Kikuyu reinstated in the lands of their forefathers, the Mau Mau will discontinue its lawless activities; until such time however, despite the obviously criminal pattern it is pursuing in attempting to achieve what may be deemed a patriotic or desirable end, it may not be classed as a criminal society.

China.—A criminal association more nearly in the Mafia-Camorra tradition is the Ching Hung Bong, parent society of the notorious Red and Green Gangs of Shanghai, Hong Kong, Chingwantao and other Chinese cities, and its older and better-known ally the Sam Hop or Chee Kung Tong. The history of these organiza-

tions is hazy—there is some authority for attributing political motivations to their founders, but the record of the past 100-odd years is one of unalloyed criminality. An attempt was made by American and British chauvinist writers during the difficult period in Chinese history at the latter part of the 19th century to confuse the Boxer society with these groups, but no organic relationship and no similarity of aims or methods were established. In the United States their activities centered in San Francisco, Seattle, and Chicago, with smaller groups in New York and other cities. They preyed generally on their fellow Chinese. From 1890 through the early 1920's they engaged in a series of tong wars which brought them unfavorably to the notice of the American police and resulted in the smashing of their organizations. Remnants today are active in narcotics smuggling and sales, illegal entry of Oriental aliens, gambling, and levying tribute on Chinese merchants.

India, North Africa.—India and North Africa provide us with prototypes of whole societies engaged in organized and continuous criminality. The criminal tribes of India—Dacoits, Thuggees (T'Hagi), Kuravers, Boureeah, Oothaegeeras, Sunoreahs, and P'hansigars—engaged in many forms of crime and trained each new generation in the arts and skills perfected by the old. Much of the information we have on these peoples has been written by British military and police officials and is not unbiased. The Indian government recently removed many of the restrictions placed on the movements of these criminal tribes and in the 1950's was engaged in a wholesale rehabilitation movement. It is thought by many that their "criminality" may be somewhat exaggerated and that circumstances of environment, conflict with occidental government and social customs, and primitive or non-civilized concepts of property rights and the inviolability of the human person, may underlie their antisocial behavior. The United States long faced a similar problem in dealing with the Moros of the Sulu Archipelago, and it is of some interest to note that the Philippine Republic itself has not been able to find an easy solution.

Maritime Criminal Societies.—The criminal fraternities of the sea have furnished the historical romanticists with the material for thousands of stories. From the Mediterranean pirates of Caesar's time, through the freebooting brotherhood of the coast, the Cornwall pirates of Merrie England, the Vitalienbruder of north German waters, the Barbary rovers of North Africa, down to the relatively recent exploits of the Caribbean gentry and the ever-present threat of pirate-boarding which still faces smaller vessels in Asiatic waters, we discover similar patterns.

Pirates stem from three sources: (1) private merchant seamen to whom letters of marque and reprisal or similar authorizations were granted in time of war to prey on enemy commerce and who, when the war was over, reluctant to return to more prosaic and less profitable peacetime cargo-carrying, raised the Jolly Roger and continued looting the vessels of all nations; (2) mutinous crews, faced with the automatic death penalty if they returned to their home country and subjected to harassment in the major ports when they attempted to carry on a legitimate commerce; and (3) slave carriers and other criminals of the sea not averse to engaging in piracy when profitable occasions arose.

That any "brotherhood" existed among this motley cabal is pure romanticizing. Whenever opportunity presented they fought with and murdered each other for pirated cargoes, as readily as they attacked innocent merchantmen. They knew no king, no code, and no law—save the law of the knife. Brutal and sadistic in their treatment of captives; avaricious and suspicious in their business dealings; crafty and cowardly but vengeful, their own testimony and the testimony of those who miraculously escaped from their clutches belie the romantic fictions of the tellers of adventure yarns. The persistent efforts of regular naval forces—chiefly British, French, and American—throughout the 19th and early 20th centuries virtually ended their depredations, although in the mid-20th century sporadic piracy on the China coast still remains a matter of lively concern to ship owners.

United States.—The United States has had much experience with criminal societies. The migration of Italian and Chinese crime organization patterns to American shores has already been touched upon. Some attention can profitably be given to those societies without foreign roots or prototypes which have over the past two hundred years presented varying degrees of difficulty to American police organizations.

The United States was and is a pioneer country, peopled for the most part with immigrants and the descendants of immigrants, many of whom were maladjusted to the society of the home country and resentful of restrictions imposed on them there. The 17th and 18th century immigrants arriving in North America found a seemingly limitless land with law and order and restrictions confined to a relatively narrow strip along the Atlantic coast. Those resenting such restriction could journey westward where, like east of Suez, there were "no ten commandments and a man could raise a thirst." Among those who pioneered the American west in the early and mid-19th century and who built up an American tradition of individual freedom of action, resistance to restriction, and antipathy to police, were many who joined in criminal associations preying on Indians, colonists, wagon trains, and even government outposts. The gold rush pilgrims en route to California and the gold trains returning to the East were alike victims (incidentally those who sought to escape this and other hazards by crossing the Isthmus of Panama were attacked by similar groups known as "derienni"); the pony express, the stagecoach, the herd of cattle, the stock of furs, nothing was safe from these desperadoes, some of them allied with Indians, some posing as Indians, some actually in the service of the United States as scouts, or agents, and even as marshals.

After the American Revolution, the War of 1812, and the Mexican War (1846-1848), such bands grew with discharged, disgruntled soldiers. But it was not until after the Civil War (1861-1865) that this form of organized criminality became so widespread as to threaten the future development of the western regions. Organized gangs became so bold that no bank, railroad, or business place even in the relatively thickly settled states of Ohio and Illinois was safe. Guerrillas had been used freely by both North and South in the war; many a soldier returned to find farm, home, and family destroyed; provisions for the orderly re-entry of veterans to civilian life with governmental assistance to those who needed it

had not been made; and the emotions roused by the war had not been assuaged by the assassination of Lincoln and the brutal "reconstruction" of the South by the runaway "Black" Republicans. Hundreds of former riders in Quantrill's guerrillas and other irregular forces swelled the ranks of outlaw bands, provided sensational headlines in the Eastern press, and evoked popular hero-worship of a number of the desperadoes.

With the organization of the Western territories into states, the setting up of public and private law enforcement agencies, and the maturing of the post-Civil War generation, these outlaw bands began to disintegrate and die. Usually the arrest and execution of the leader sent the followers into hiding or forced them to break up and either join the dwindling number of gangs still active or seek an honest, though less adventurous, livelihood. The names of the James and Dalton bands have been written indelibly on the history of the West of this period.

Not so casually, however, can be treated the Ku Klux Klan and the Molly Maguires (qq.v.), contemporaries of the post-Civil War desperadoes. The Klan, organized originally about 1865-1866 to offset some of the ill effects of the Reconstruction program of the punishment-minded men who controlled Congress and to insure white supremacy in the South, was disbanded in 1869, although sporadic violence against Negroes continued for some years. From the early 1870's until 1915 local groups, often using Klan regalia, methods, and name, terrorized Negroes, Catholics, Jews, aliens, and labor organizers, particularly in the Carolinas, Georgia, Mississippi, Alabama, and Tennessee.

In 1915, these scattered groups and new units in many states not of the Old South organized a new and militant Ku Klux Klan, vicious in its methods and powerful enough to control the political machinery of several states and many counties, towns, and villages. With intermittent setbacks, it has pursued its criminal career and it is still, though usually thought dormant, sufficiently dangerous to be on the list of subversive organizations issued by the attorney general of the United States; and has been all too recently (1952 in Florida) responsible for outrages and invasions of civil liberties in many areas of the country.

The Molly Maguires were a small group, racially homogeneous, and related perhaps to the Irish Republican Brotherhood, who rose briefly and terribly to prominence in the coalfields of Pennsylvania in the 1870's. Here the Irish anthracite miners were bossed principally by English and Scotch supervisors; coal mining was a dangerous, ill-paid, man-killing work; there was no union; and all sorts of practices had been introduced to mulct the worker of his day's pay. The Irish miners organized into a secret society about 1865 principally to combat brutality by their overseers, and launched an unprecedented campaign of killings, beatings, and destruction of property. For more than a decade they terrorized the mine fields, but their power was destroyed through the spying activity of a fellow Irishman, James McParlan, who had been employed by the Pinkertons on behalf of the mining companies. Mass arrests were made in 1877 and 20 were hanged.

Worthy of note is the imitation of adult crime organization patterns by juvenile gangs, usually of a transient character but occasionally self-

perpetuating. War-ravaged countries usually spawn such wolf-packs and our own depression period in the 1930's presented a major police problem in the "wild boys (and girls) of the road." In our larger cities, and occasionally in some rural areas, juvenile hoodlums, sometimes allied loosely with adult criminal gangs, but at other times operating independently, have proved dangerous to life and property, and troublesome to law enforcement agencies.

Modern crime in the United States is organized crime only in the larger outlines of those criminal occupations which of necessity require such organization. Thus burglars, robbers, murderers, and rapists are not organized, but there are large and powerful syndicates controlling gambling, the narcotics traffic, and various forms of extortion and thievery. Some of these syndicates are loose nationwide confederations, others purely local. Often they are allied with public officials and with the police; they are occasionally found working hand-in-glove with both political parties and with labor unions (for example, the exposure in 1952 of the intricate working relationships between the International Longshoreman's Association and the dock racketeers in New York City); and often they have a degree of public acceptance or public support that would be shocking if not further analyzed.

The pro-desperado, anti-authority orientation of the American people already adverted to was maximized during the period of the 18th Amendment and Volstead Act (Prohibition) from 1920 to 1933. The gangsters who defied authority to bring whiskey, wine, and beer to a thirsty populace, and the police and politicians who protected them and shared their profits, were accepted in the best circles, envied by some of the law-abiding, and hero-worshiped by many youngsters. A similar situation exists in the field of organized gambling—the law-abiding citizen who wishes to make a small bet and cannot go to the track to do so legally is not going to rise in wrath against the organized criminal combine which makes it possible for him to make his wager illegally at his corner bookmaker. That the Prohibition gangsters murdered and engaged in other forms of crime, and that the gambling syndicates use their profits to finance other, less acceptable, criminal activities has not diminished their social standing among those who demand the services they perform.

The level of criminal tolerance is higher in certain areas of the United States than in any other part of the civilized world; the power of organized criminal societies in some of its larger cities is fantastic; the ineffectiveness of the police is due in part to poor organization, poor recruitment and poor training, but in greater measure to the lack of public support for enforcement of ill-considered laws which a large segment of the public opposes.

The suppression of organized criminal societies solely by police action is impossible, as has been abundantly demonstrated in country after country. Law enforcement and intelligence agencies have achieved some success by infiltrating police officers into the various groups, often at the cost of an officer's life, to observe and report on organization, activities, identity of leaders, and future plans. Again, the police have successfully employed informers and occasionally obtained enough evidence by intensive questioning, or "grilling," of arrested gangsters. But usually the

lower echelon members have little real knowledge of the far-flung activities of the society or of its real leadership.

The cowardly allegiance of businessmen and politicians to these groups, and their failure to report extortion threats and other criminality, handicap the police. It has been suggested that a law making it a punishable offense to pay tribute to an organized criminal group without reporting to the police would have a salutary effect on at least one phase of their operations.

The folklore and public stereotypes surrounding these criminal groups—that they are ubiquitous and omnipresent, that their vengeance carries over into the beyond, that they are as skillful as they are sinister, and that they are the friends of the poor and helpless—aids them in maintaining the law of *omerta* as far as their activities are concerned. It is common knowledge in American law enforcement circles that these criminal societies often take credit both for crimes and philanthropies with which they have had no connection, in order to maintain these fictions concerning their real activities and real purposes. Only an aroused and cooperative public, supporting an efficient police unit, can eliminate them.

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DONAL E. J. MACNAMARA,
Assistant Director, New York Institute of Criminology.

CRIMINOLOGY is a part of the branch of sociology called social control. The penal treatment of the criminal is the most drastic form of social repression. Punitive law takes its place alongside custom, public opinion, moral principles, religious beliefs, magical ideas, and many other forms of social control. The acts penalized by law vary greatly from time to time and from place to place. But, at all times and everywhere, there exists some sort of social organization wherein the law prohibits those acts which menace it. A crime may be defined, therefore, as an act which the law forbids and punishes; which is almost always immoral according to the prevailing ethical standard; which is usually harmful to society as organized at a given time and place; and whose repression is, in the long run, necessary or supposed to be necessary for preservation of the existing social order.

Criminology utilizes data derived from several sciences. Zoology, anthropology, and history contribute to describing the nature, origin, and evolution of crime. Meteorology, geography, demography, and the special social sciences such as economics and politics, aid in analyzing environmental causes of crime. Anatomy, physiology, psychology, and psychiatry furnish facts as well as methods for studying the various traits and the types of criminals. Comparative jurisprudence deals in part with the penal treatment of crime and the criminal. Upon these data are based the six branches of criminological science: (1) the origin and the evolution of crime; (2) criminal sociology; (3) criminal anthropology; (4) criminal psychology; (5) criminal jurisprudence; and (6) penology.

Origin and Evolution.—Crime originated in violations of customs among primitive peoples; its evolution may be traced concurrently with the evolution of the state, government, and law. Criminogenic elements exist in the physical environment, the demographic conditions, and the economic and political organization of society. Criminal traits and types arise from the organic and mental bases of criminality. The distribution of criminals with respect to age and sex requires consideration.

Criminal Sociology.—The ecology of crime is studied in the influence of the physical environment upon criminal conduct. This influence can be detected in some phases more or less directly; in others, only indirectly. The effect of topography and the nature of the soil is considerable but can be measured only indirectly if at all. Influence of climate, season, and weather upon criminal conduct can be studied more directly. This study involves a consideration of the temperature, the variations of heat and cold, the relative length of the days and the nights, the humidity of the atmosphere, the precipitation of rain, and the atmospheric movements in the form of winds. Statistics suggesting certain correlations between these telluric conditions and the extent and character of crime have been accumulated.

All social phenomena are influenced by the density and the distribution of population. Civilization itself could not have come into being until the human population had attained a relatively high degree of density. The concentration of population in villages, towns, and cities is of even greater significance for the study of crime. Urban crime exhibits peculiarities as compared with crime in rural districts. Increase in the density of population creates new conditions in which more regulations are necessary to harmonize the conduct of individuals. This situation becomes especially acute when the population is highly concentrated and congested, as in a large city. A comparative study of urban and rural conditions involves an extensive research into the demographic factors in the causation of crime.

Like every animal species, mankind is engaged in a struggle for existence. This is true both of the human species as a whole and of individual human beings. The human struggle for existence has become in large part an economic struggle; that is to say, a struggle to obtain the commodities needed and desired within a system of production based upon the division of labor and exchange. This struggle, though it becomes more complex and indirect in its character, is no less bitter than among many animal species, and is as all-pervasive. It influences every important

aspect of mankind. It is of special significance with respect to criminal activity, because much of this activity arises directly from the economic struggle, while most of it is conditioned by the economic environment. The criminality of any time and place is conditioned and, to a considerable extent, determined by the existing economic system. Where the methods of production are not highly developed, so that the wealth of the community is limited, the living conditions are likely to encourage crimes against the person. As methods of production become more complex and wealth increases, more crimes against property become possible. To measure the direct and immediate influence of economic forces upon criminality, four methods are used:

(1) Fluctuations in the amount of crime may be correlated with economic changes, such as those which recur in the business cycle and those which arise from technological progress.

(2) The economic crimes or crimes in which economic motives apparently are predominant, may be segregated from the crimes in which the economic factor plays a smaller part.

(3) The economic status of criminals may be studied, taking into account the occupations to which they belong as well as the general distribution of wealth.

(4) Professional criminality, or the criminality of those who make of crime a profession and an occupation, may be studied.

In connection with these methods, various economic phenomena and conditions, such as the extreme variations in the distribution of wealth, the pressure due to poverty inducing criminal acts to avoid starvation or to secure a higher standard of living, unemployment, low wages, mendicancy, vagrancy, and other forms of dependency giving rise to crime, should be considered. In fact, the analysis of the economic factors in the causation of crime is the most extensive and complicated problem in the field of criminology.

The political organization of society is determined in large part by the economic organization. But the form of government and the laws promulgated and enforced have some effect, in turn, on economic and other social conditions. The extent to which these conditions can be influenced by the government—and consequently the extent to which criminal conduct can be attributed to government—depends in part upon the prevailing view of the government's functions. There are many of these theories ranging from the extremely individualistic theories of the *laissez faire* philosophers, through the social welfare theories, to the socialistic theories. A government may give rise to crime because it is ineffectively organized or because, even though well organized, it is inefficiently administered. Its effectiveness depends in large part upon the place and the time in which it exists. A form of government well suited for barbarous people may be most unsuitable for a highly civilized people. Hence, it is impossible to generalize with respect to the form of government. Likewise, the efficiency of the administration will depend partly upon the place and the time. The law has usually been unscientific, because it has not been based upon scientific knowledge as to the causes of crime and the traits of the criminal. This knowledge can be used so as to render much more effective both the suppression and the prevention of crime. Governments usually have

failed to gather and make use of statistics, which are of high value in measuring the effects of the different kinds of penal treatment and in throwing much light upon the causes and the conditions of crime.

While economic and political factors are the most important in the causation of crime, there are other aspects of culture which require study. Among these are religion, art, recreation facilities, the press, and education. The influence of these factors is, in the main, indirect. It requires a complicated technique of investigation not yet elaborated.

Criminal Anthropology.—Apart from the criminogenic factors in the physical and social environment, the principal data of criminology are the traits and the types of the criminals themselves. The organic basis of criminality is in the criminals' anatomical and physiological traits. While theories concerning the "born criminal" and the "instinctive criminal" have been shown to be unsound, some hereditary traits predispose their subjects to certain kinds of criminal conduct. The organic traits and processes are, therefore, of fundamental importance in the causation of criminality. While there is no evidence of a type predestined from birth to become a criminal, there are congenital traits within many individuals, which are likely to give rise to criminal conduct under favorable circumstances.

Criminal Psychology.—The mental basis of criminality is partly in certain types of mental abnormality. Amentia is subnormal cerebral development. Dementia is mental deterioration after the brain has developed. Insanity is a derangement of thinking and of conduct due to a pathological state of the nervous system. A psychosis is a severe mental disorder. Neurosis is a disease of the nerves or nervous system. The major neuroses are epilepsy, neurasthenia, hysteria, and psychasthenia, each of which, under certain conditions and in various ways, may lead to criminal conduct. A person may acquire abnormal habits as a result of certain environmental influences, without having a previous morbid basis. Alcoholism or drug addiction may cause a pathological neural condition, which gives rise to a mental disease.

At all times and places, many criminals are persons who are not well adapted to their social environment, because they cannot adjust themselves to the existing customs and standards of society. Some of these individuals cannot adapt themselves to the existing social order, but may be able to adjust themselves to another kind of society. Other criminals are incapable of adapting themselves to any kind of social system; thus they constitute a universal type of criminal. Many combinations of mental traits lead to lack of adaptability.

There are those who cannot adapt themselves to the existing social regime, for they believe it to be wrong, but who also cannot adapt themselves to any kind of social order. A person may become criminal because of abnormal features in his instinctive make-up. This happens because certain instincts are unusually strong or exceptionally weak. If the pugnacious tendency is abnormally strong; it may lead to acts of violence; or if the parental impulse is weak, it may lead to neglect of offspring. A person may become criminal because of some abnormal features in his affective make-up. If the feelings relating

to reproduction, sex, and allied matters are excessively strong, they may lead to crimes of passion; if they are unusually weak, their subject will lack sympathy and will not be inhibited from inflicting pain upon others. The situation with respect to the intelligence is somewhat different. The intellect has no moral significance in itself. But a strong intelligence is not likely to be associated with these abnormalities of the impulsive and affective traits. It is able to comprehend social standards and their justification. A weak intelligence, on the contrary, is likely to be associated with these affective and impulsive abnormalities and find it difficult to comprehend social standards and their justification. The difference between these criminals and mankind in general is only one of degree. No person can become perfectly adapted to the social system under which he lives. Everyone violates moral, legal, and social conventions to a certain extent, therefore being somewhat abnormal and pathological.

Failure to become entirely adjusted is not caused entirely by individual traits, but may grow out of some social system, none of which can be so delicately organized as to obviate all maladjustment. However, most individuals acquire sufficient knowledge and also develop enough self-control to enable them to associate fairly well with their fellows and to avoid violations of social conventions so flagrant in their nature as to bring upon them severe penalties. The majority of those who commit criminal acts are almost normal. In fact, nearly every person is destined, at one or another time, to commit criminal acts. But the great majority are not caught. Most of those who are caught belong to the occasional and professional criminal classes, which include the majority of the criminal population.

The following classification of criminal types suggests the range from the abnormal to the normal: (1) the criminal ament or feeble-minded criminal; (2) the psychopathic criminal; (3) the professional criminal; (4) the occasional criminal, as the accidental criminal, or the criminal by passion; (5) the evolutive criminal of which the political criminal is an example.

The professional class includes criminals who are not feeble-minded or psychopathic, but who commit crimes repeatedly and support themselves entirely or in part by means of their criminal activities. They range from the "big" expert professionals, who reap large profits from their criminal careers, to the petty offenders, who eke out a precarious existence, but who are too stupid and weak by birth or as a result of their experience to commit more profitable crimes. They vary from those who, though not feeble-minded or psychopathic, possess abnormal or pathological mental traits, which have led them into a criminal career, to those who are normal, but have been led into crime by their training and circumstances. They range from those who have deliberately chosen a criminal career, who are the only ones recognized by some criminologists as professionals, to those who have drifted into it largely through force of circumstances and with little or no choice of their own.

The class of occasional criminals also comprises a considerable variety of criminals. It includes all those who, under the pressure of unusual circumstances, sometimes also abetted by pathological mental traits, commit one or a

very few crimes in the course of a lifetime. However, in this group may be some individuals who eventually will become professional criminals. The accidental criminals are led to commit crimes under peculiar circumstances and almost through no choice of their own. The criminal by passion is not feeble-minded or psychopathic, but may possess a somewhat excitable temperament. Such a person may commit a crime, usually a crime against the person, under the pressure of unusual circumstances and under the influence of the passion aroused by those circumstances. He would not commit a criminal act under any other circumstance.

While in the United States, evolutive crime and the political criminal have been completely ignored, in jurisprudence and penology and generally in criminology, in some European countries they have received more adequate treatment. It is customary to distinguish between common crimes and political crimes. The former are acts contrary to the law, committed in the interest of the criminal himself or of those personally related to him. The latter are acts contrary to the law, committed against an existing government or form of government in the interest of another government or form of government. They include many political assassinations; acts against government committed by rebels in revolts, revolutions, and civil wars; many treasonable acts and acts of espionage; and all warlike acts in time of war. It is the intent and purpose underlying a treasonable and illegal act which determines whether it is a political or a common crime.

There are other illegal acts which are not common crimes and yet are not political in the usual criminological sense. They are committed in accordance with and in defense of human rights and in the course of movements for social and economic changes. Their immediate object usually is to induce far-reaching and fundamental social and economic changes, which thus will affect the form of government. Among these crimes, which are broader than the ordinary political crimes, are offenses in defense of the rights to freedom of thought, belief, speech, and publication; and offenses by conscientious objectors to the payment of taxes or to military service; by workers in strikes and other labor disturbances; by reformers who are trying to effect changes in the relations between the sexes and in other social situations. Common crimes are almost invariably antisocial, while offenses which are directly or indirectly political are usually social in their intent and often beneficial to society in their ultimate effect. The latter are social and evolutive as contrasted with involutive or atavistic common crimes.

Description of the principal criminal types is one of the major problems of criminology. Closely related to it is the question of the size of the criminal population and its distribution among the criminal types. In the criminal population should be included those who, at a given time and place, menace society with antisocial acts which law has forbidden. Among them are feeble-minded and psychopathic criminals; professional criminals; and occasional criminals of the moment, such as those who have committed crimes by accident or by passion, but are not likely to commit any more crimes, cannot be said to menace society, and should not be included in the criminal population.

Criminal Jurisprudence.—This science has been studied by lawyers and political scientists who explore the development as well as the present status of law and the mechanism of judicial procedure. As the law is one of the principal forms of social control, it has great sociological significance. While the sociological study of criminal jurisprudence falls properly within the field of criminology, the study of civil jurisprudence also has some criminological significance.

In the early stages of cultural evolution many acts regarded as injurious were punished by private vengeance, usually with the approval of the community. Most of these acts later became either public or private wrongs under the law. The acts considered as harmful to the whole community became crimes or public wrongs, to be punished under the criminal law; while the acts regarded as harmful only to individuals became torts or private wrongs, to be redressed under the civil law. It usually has been assumed that no moral turpitude is involved in torts. There has always been more or less shifting of wrongs back and forth between the criminal and the civil law, so that an act which is at one time regarded as a private wrong is, at another time, regarded as a public one and vice versa.

After criminal law had come into existence, it became necessary to devise a mechanism for applying it. Two things must be accomplished: to determine that a crime was committed and to ascertain who committed it. Criminal procedure has evolved to perform these functions and is operated through courts and judges. The purpose of a criminal trial is to gather, to examine, and to weigh evidence. Consequently, the larger part of the mechanism of criminal procedure is devoted to this work, which ranks evidence as the subject of central importance in the study of the rules of procedure.

Penology.—Study of the origin and evolution of punishment and of the varying conceptions of penal responsibility is the province of penology. Penology has been concerned with theories as to the sanctions for punishment and as to the basis of penal responsibility. One of the earliest justifications for social control was religious. This justification assumed that penalties must be inflicted for violations of the divine law. The religious sanction for penal treatment is punitive and expiatory in the sense that this treatment is a punishment and a retribution for sin. Later came the moral sanction for punishment, based upon belief in a moral law, which is reparatory and exemplary in the sense that penal treatment repairs, in a measure, the breach which criminal conduct has caused in the moral law. In more modern times, the theory that society must be defended against conduct which is, or is supposed to be, injurious to it has acquired influence. The social sanction for punishment is deterrent and preventive in the sense that penal treatment is for society's protection and improvement, and not to make good an injury, which can be obliterated only in part, if at all.

The theories of penal responsibility have ranged from the theories based upon the free will of the individual, through the theories of partial individual responsibility, to the deterministic theories. In accordance with the theories of free will, it has been the tendency to adjust penal treatment to the nature of the criminal act committed. In recent times, the principle of the

individualization of punishment, according to which the penalty is adjusted to the character of the criminal, has gained much influence. This principle recognizes that the character of the individual is determined in large part by forces external to himself, and that society can be protected more effectively against antisocial conduct by changing the character of the criminal than by punishing his criminal acts. The penalties which have been inflicted should be studied in the light of these varying and, to a certain extent, conflicting theories of penal responsibility and of sanctions for punishment.

Variations in Criminological Concepts.—During the 20th century the realization has grown that the concept of crime and of criminal law has become partially obsolete, and that there should be a transfer of emphasis from theft and other petty economic crimes to the much more dangerous, complicated "white collar" crimes. The concept of property is changing and it is recognized that monopolistic and fraudulent business practices cause vastly more harm than the petty crimes. A German-English criminologist (Hermann Mannheim) said: "In the future, we shall have to get used to the idea that not only protection of property, but also the protection against property falls under the scope of the criminal law." Since World War II, it has been recognized that the warmongering and belligerent acts of public officials, which lead to the supreme catastrophe of war, are criminally responsible to mankind.

Criminology in the United States has not given adequate attention to the past and present concepts of crime and of its treatment other than the Anglo-American concepts. Among them are the Oriental and the Soviet concepts. The latter are the most important for the present and the future owing to the great abbreviation of individual property, which now consists mainly of consumers' goods in Soviet countries, and the vast expansion of socially owned means of production. In the USSR "crime" and "punishment" are now called "socially dangerous act" and "measure of social defense," which reflect these changes. The former is defined as any act against the Soviet system.

Crime as a social phenomenon will continue to change as long as society changes. These changes will be in the nature and extent of crime and in the ways in which society reacts against criminal conduct. New social conditions create new occasions for conflict between individual interests, while obsolete causes of conflict disappear with changing conditions. The increase or decrease of crime depends upon the proportion between new and old causes of crime. The continual shifting of ethical standards will always add new forms of conduct to the list of crimes and, at the same time, will remove other forms of conduct from the penal code. Like other branches of sociology, criminology is subject to a continual variation in its field and to a shift of emphasis in its problems.

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and often discontinued entirely, wherefore stocks of goods become depleted. On the return of confidence and the renewal of activity, through the resumption of buying by the public, the manufacturing plants experience difficulty in filling orders and their owners or managers therefore borrow money or cut down their working capital to remodel and extend their plants or to purchase extra equipment or for some other form of fixed asset. Often large sums are invested merely in anticipation of future increase in demand and production, mills and railroads being excellent examples of such preparations for future prosperity. Usually this work is carried too far; the means of production outstrip the demand for goods; the ratio between current assets and liabilities is reduced; and such enterprises, with impaired working capital, are liable to insolvency when trade depression sets in. In order to prevent the disruption of industry through the over-extension of credit there must be some means to safeguard the granting of short time or indefinite credits and an emergency currency that will allow a large portion of these loans to be liquidated safely within the brief period of a panic. The usual safeguards are the credit reports of the mercantile associations, the registry of commercial paper and the demand for audits by certified public accountants. The facilities for quick liquidation have been extended by the Federal Reserve system of banks. See CREDIT; CURRENCY; BANKS AND FINANCE—16. *Federal Reserve System of the U.S.*

Crises have been confined practically to western Europe and to the more advanced American countries. In the United States the most notable crises have been those of 1819, 1837, 1854, 1857, 1873, 1884, 1893, 1907, 1914, 1921, 1930. All nearly coincident with crises occurring in England, the crises of 1837, 1857, 1873, 1930 may be called international in extent. Prior to and during the War of 1812 there had been much wildcat banking and the country was launched on a paper money era, the banks being unable to secure specie sufficient to redeem even a small portion of their paper. In 1814 Congress refused a charter to a proposed national bank and people began to lose faith in banks and to withdraw their money. Banks in the South ceased to redeem their notes and on Aug. 28, 1814 the Philadelphia banks suspended specie payments, followed by others in the North and in Ohio, until every bank in the seaboard states had taken similar action. But by threats and legislation the state and federal governments compelled these banks to resume specie payments which the majority had done by the latter part of 1817. Meanwhile in 1816 Congress had established a bank of the United States to regulate the currency. On the conclusion of the war foreign trade began to revive which required vast sums of money; in 1814, while the blockade was in force, the imports were valued at \$12,965,000 and exports at \$6,927,441, but in 1815 these figures had risen to \$113,041,274 and \$52,557,753 respectively and in 1816 to \$147,103,000 and \$81,920,452. Furthermore, during the blockade, when commerce was practically at a standstill, the merchants transferred their capital to manufacturing establishments and when the lifting of the blockade resulted in a vast influx of foreign made goods, protection was demanded for the industries, resulting in the enactment of a protective tariff in 1816 (amended in 1818). Meanwhile in 1815 a

commercial convention had been concluded with Great Britain, under the terms of which each country was to regulate, as it saw fit, its trade with British North American and West Indian possessions. In retaliation for a supposed discrimination against them in American regulations, the merchants of Nova Scotia and New Brunswick secured the passage of the "Plaster of Paris" Act which prevented the transportation of this article in American vessels to the place of consumption. Great Britain then excluded American ships from the West Indies and as these acts rendered idle 100,000 tons of American shipping the shipping interests were prostrate, all allied trades languished, and thousands of mechanics were thrown out of work. In 1811 steamboats had been introduced on western waters and capital and enterprise turned to the task of opening the West. Owing to the ease with which people could secure paper money from the wildcat banks, there was widespread speculation in lands, the record of public land sales being 270,000 acres in 1813, 1,120,000 in 1815, 2,160,000 in 1817, 5,470,000 in 1819 and 820,000 in 1820. Everyone hastened to plunge into debt, expecting to become rich thereby, but when the banks began to contract their discounts and currency began to be reduced, the debtors were unable to meet their obligations and general bankruptcy followed with its attendant hardships in all circles. There was a general depression in business. Many blamed the tariff but the greatest outcry was against the banks, both state and national, and accordingly there was a wave of antibanking excitement throughout the country. But this soon subsided, the states enacted stay laws, prohibited imprisonment for debts less than certain amounts, passed acts against usury, and conditions became about normal in 1821. The "Panic of 1819," as it was called, was the third economic crisis in the nation's history, preceded by less severe crises in 1785-1788 and 1791. It was followed by a mild depression lasting from 1825 to 1829.

In 1832 President Jackson became convinced that the Bank of the United States was using its funds insidiously and ordered the government funds deposited therein to be withdrawn. Since \$9,891,767 in public money was on deposit, the bank was compelled to curtail its loans and could not use any of the public deposits for the benefit of the commercial community. As a result money became scarce, discounts rose rapidly and in 1833 many business houses failed. Jackson's quarrel with the bank resulted, in 1834, in its failure to secure a renewal of its charter, and its career as a national institution was practically ended. Almost simultaneously the national debt was paid off and the treasury began to have a surplus, wherefore a bill was passed in 1836 providing that all but \$5,000,000 of the money in the treasury on Jan. 1, 1837 should be deposited with the several states in proportion to their representation in Congress, and in order to safeguard the deposits the secretary of the treasury was to select the state banks for depositories. The effect of this distribution of surplus revenue among the states was the formation of new banks with nominal capital and the flooding of the country with paper money. In 1837 there were more than 600 such banks with an aggregate capital of \$291,000,000, of which \$149,000,000 was in circulating notes and \$127,000,000 in deposits, while their total loans and discounts amounted to

\$525,000,000. Wild speculation occurred, especially in land, millions of acres being bought and held for a rise. Prior to 1834 the annual sales of land never exceeded \$4,000,000 but in 1834 the receipts were \$4,887,000, in 1835, \$14,757,000 and in 1836, \$24,800,000. But this consisted not of specie but only of credit on the books of the banks that held government deposits. Early in 1837 the banks began to call their loans, to curtail their accommodations and to increase rates of interest. Owing to the crisis in England specie ceased to be imported, whereupon the price of money rose. To make matters worse the wheat crops of the eastern States had been seriously damaged by a scourge of the Hessian fly, wherefore the price of wheat and flour rose rapidly, until early in 1837 wheat brought \$2.25 per bushel and flour \$12.50 per barrel, which caused several flour riots. Furthermore an abnormally large cotton crop the previous year was accompanied by a proportionate slump in prices and a consequent depreciation in the credit of those connected with the cotton industry. Soon three great cotton firms in New Orleans failed with liabilities of \$2,500,000, to be followed immediately by three New York firms with liabilities of \$9,000,000. By the first week in April the failures in New York numbered 98 with liabilities of over \$60,000,000 and two weeks later they numbered 168. Real estate, and railroad, canal and other stocks depreciated in value and thousands of workmen were deprived of employment. Prior to this time President Jackson had caused the "Specie Circular" to be issued, requiring all public land agents to accept nothing but specie in payment. This compelled the banks to redeem in specie practically their entire circulation, and as the contingency caught them unprepared, on 9 May 1837 they suspended specie payments and not until two years had passed did the last of the banks resume. Before that, however, Congress had enacted a bankruptcy law and the States had passed statutes of limitations and similar measures, so that some order began to appear out of the chaos. The most important result of the suspension was the establishment of the independent treasury system in 1840. Moreover, from 1837 to 1842 the number of banks of the country was reduced by nearly 100, circulation and deposits were cut in two, and the banks in general exercised more caution.

In 1854 came a stringency in the money market and hard times began to press upon the country. Trade was more sluggish than at any time since 1837. Money was hard to obtain and the very best paper sold at 10 and 12 per cent, some going as high as 1½ per cent per month. The export of specie from the country was large. These conditions brought on a panic in Wall street in September 1854 which was followed in November by financial disasters in the West and South and the suspension of many banks and bankers. This monetary panic and the subsequent depression were only a precursor of the panic of 1857. After a few minor failures the Ohio Life Insurance and Trust Company of Cincinnati failed on 24 Aug. 1857 with liabilities of over \$7,000,000. This created a panic in Wall street and many brokers and bankers were unable to meet their obligations. On 25 September the Bank of Pennsylvania at Philadelphia suspended payments, to be followed soon by banks in almost every section

of the country. Early in October the Illinois Central Railroad made an assignment, the New York and Erie Railroad Company protested its notes and the Michigan Central suspended payment on its floating debt. The prices of commodities rapidly declined, factories and workshops suspended and thousand lacked employment. Armies of workingmen, desperate in their fear of starvation and poverty, paraded the streets of cities, rioting occurred in many places, and the militia was called upon to restore order. In 1857 there were in the United States and British provinces 6,022 failures, with liabilities of \$282,335,000, and during the first three months of 1858 there were 1,540 failures, with liabilities of \$31,733,000. The causes of the panic have been attributed to various circumstances, such as the reduction of the tariff, the speculation engendered by the influx of gold from California (which caused the belief to prevail that no undertaking was too stupendous for the fortunate nation to undertake), the enormous extension of railway lines, the expansion of bank loans and circulation, the export of specie, the increased importations of merchandise, and undue extension of credit. During 1858 the depression continued unabated but at the opening of 1859 good times seemed to have returned. The South was prosperous, general crops were bounteous and prices were high, but in June 1859 a killing frost laid low the crops of wheat, grain, potatoes, vegetables and fruit in New York, Pennsylvania, Ohio, Indiana and Illinois. Nevertheless by 1860 another season of prosperity seemed at hand, only to be stifled by the Civil War.

In the spring of 1873 occurred a sharp reversal of previously prosperous business conditions. In anticipation of profits, a speculative spirit had been aroused which produced an overproduction in every branch of industry, a general glut of the market and a ruinous decline in prices. Money gradually became tight, discount rates advanced rapidly, and by September little money could be borrowed at any price. After the downfall of a few smaller concerns, the panic broke forth on 18 September when Jay Cooke & Co., of Philadelphia, suspended, as a result of which stocks slumped on the exchanges and a score of brokerage houses, banks and banking firms were forced to the wall. Suspension of payments occurred first at New York but extended to all the larger cities and continued until 1 November. The panic in the "Street" was of short duration but its effects were apparent in commercial and industrial circles for months, thousands of establishments being handicapped or completely prostrated by the lack of available funds to conduct their business. Between 1873 and 1876 the mercantile failures were \$775,000,000 and the defaults by railways up to 1 Jan 1879 amounted to nearly \$800,000,000. The number of bankruptcies up to 1878 was 10,478, while the depression following the panic was even more fatal to productive industries. Between 1873 and 1879 these failures numbered 47,000 and the money loss was \$1,200,000,000. It is estimated that 3,000,000 men were thrown out of work. The depression extended to many parts of the world.

In 1883-84 another period of panic and depression began. The gigantic speculation in railroads reached its zenith about 1880 and a retrograde movement set in. President A. T.

Hadley in his 'Railroad Transportation,' says that of the 29,000 miles of road constructed in 1880-82 only a third was justified by existing business, another third might be profitable some time in the future, and of the remainder some were built to put money into the hands of the builders as distinct from the owners, some were built to increase the power of existing systems, where they were not needed, and some were built to sell as a blackmailing scheme against other roads. During 1883 there were a few small commercial failures and on 1 Jan. 1884 the New York and New England Railroad went into the hands of a receiver. During 1884 and 1885, 41 railway corporations, holding 19,000 miles of track, were placed under receivership and 37 smaller railroad properties were sold under foreclosure. Moreover in the spring of 1884 a decline in the prices of agricultural products occurred. Owing to a great increase in the world's wheat crops, the price fell below that of 1878, resulting in stagnation of interior trade, because farmers held their produce for more favorable market conditions. Hence railway freight traffic was greatly diminished, thereby reducing railway stock dividends, and consequently investors hesitated to embark in railroad enterprises of great magnitude. In May 1884 came the failure of the National Marine Bank of New York, the president of which was associated with the firm of Grant and Ward, which failed shortly afterward with liabilities of \$17,000,000. Several other banks and banking houses failed, the total liabilities of the wrecked concerns being about \$240,000,000. While the panic centred in New York, there were numerous failures in other cities, 11 national banks and about 130 other banks and private bankers being counted in the list. There was no suspension of specie payment during the panic and this, together with bounteous crops, tended to improve conditions, the general distrust diminished, credit circulation was re-established and the discount rates resumed their normal level.

For some time prior to 1894 the foreign financial situation had been much upset and in 1890 the firm of Baring Brothers of London failed with home liabilities of over \$100,000,000. Consequently English holders of American securities dumped them into our market and gold began to flow toward London; this export of gold was further enhanced by high rates of exchange in foreign financial centres and heavy imports of merchandise in 1891. Early in 1892 conditions changed and owing to our enormous exports of wheat a considerable portion of the gold returned, thus restoring our depleted gold reserve. But for various causes the price of wheat suffered a serious decline, English investors became alarmed at the condition of the United States treasury and currency, and, fearing that we might enact a free coinage silver law, again sold their American securities with the result that, owing to exports of gold, the reserve had fallen to \$114,231,883 in May 1892 and was likely to fall below the legal limit of \$100,000,000. The Secretary of the Treasury then discontinued the payment of debts in gold and began to hoard it, and the year passed without much further financial trouble. But prices and cost of living had been advancing without any compensatory increase in wages. The workmen were in a relatively worse condition than before and struck for higher wages, several

disastrous clashes occurring in 1892, especially at Homestead, Pa., in the Cœur d'Alene mining region of Idaho and in the Erie and Lehigh Valley Railroad Yards at Buffalo. In November 1892 Cleveland was elected President on a platform calling for a parity between gold and silver coins, and creditors feared that the government either could not or would not redeem its legal tender notes in gold coin, there being only \$100,982,410 in the gold reserve when Cleveland assumed office, and barely \$25,000,000 in other forms of money. Hence, according to Lauck, the widespread apprehension as to the fixity of the gold standard of payments, together with general industrial unrest, caused the panic of 1893. On 20 Feb. 1893, before Cleveland assumed office, the Philadelphia and Reading Railway, with \$40,000,000 capital and \$125,000,000 debt, went into bankruptcy; on 5 May came the failure of the National Cordage Company with \$20,000,000 capital and \$10,000,000 liabilities, these failures causing a heavy slump in the stock market. On 26 June the government of British India suspended the free coinage of silver and the price of silver dropped in three days from 82 to 67 cents per ounce. In July the Erie Railroad failed and the Milwaukee Bank suspended, causing runs on banks, particularly in New York. In August the House of Representatives voted to repeal the Sherman Silver Purchase Law, but though this helped to restore confidence, the Senate failed to act until 30 October (Cleveland signing the bill 1 November), when it was too late to stem the tide of disaster. In December 1893 the Comptroller of the Currency announced the failure during the year of 158 national banks, 172 State banks, 177 private banks, 47 savings banks, 13 loan and trust companies and 6 mortgage companies, though a few of these afterward resumed business. In 1894 156 railway companies, operating nearly 39,000 miles of track, were in the hands of receivers, the total capitalization of these companies being about \$2,500,000,000, or one-fourth the railway capitalization of the country. Commercial failures increased from 10,344 in 1892, with liabilities of \$114,000,000, to 15,242 in 1893, with liabilities of \$346,000,000. The problem of the unemployed became acute and relief committees were organized in many cities; numerous demonstrations by the unemployed occurred, the most spectacular being the march to Washington in April 1894 of the "industrial army" under J. S. Coxey to demand help from the government. In the same month 130,000 miners stopped work, followed later by 25,000 more; in June to July occurred the Pullman boycott in Chicago; other strikes took place at New Bedford, Fall River and New York; and in January 1895 the employees of the Brooklyn Electric Railway system went on strike. Agricultural disaster also overtook the country in 1894, a drought ruining the corn crops of Iowa, Kansas and Nebraska, reducing the yield to one-fourth that of 1893. The wheat crops were larger, but so were European wheat crops, and as there was no market either abroad or at home the price of wheat declined to its lowest mark, 49 cents per bushel, and similar declines were experienced in the prices of corn, oats, rye and barley. In August 1894 the Gorman-Wilson Tariff Bill became law, the treasury reserve was kept intact during the next two years by

the sale of gold bonds, and the public began to regain its confidence in the government and the stability of business institutions, which was further enhanced by the election of McKinley in 1896 on a protective platform and by the enactment of the Dingley tariff in 1897.

The crisis of 1907 has been called a "rich man's panic" and the "panic of undigested securities." Under the fostering protection of the high tariffs came the organization of numerous consolidated corporations known as trusts, of which, according to one authority, 225 sprang into existence during 1899 to 1903. An era of prosperity set in but in 1906 the life insurance scandals and the subsequent investigations and legislation tended to throw discredit on some of the business methods in vogue. In spite of these revelations, the year 1906 was the most prosperous the country had known, crops being abundant, wages high, iron and steel production enormous, freight business beyond capacity, dividends earned on non-paying stocks and money plentiful for promoting any kind of speculative enterprise. By the end of the year, however, affairs began to take a downward turn, due in part to the Lawson articles, in part to the prosecution of corporate interests by the Federal government under Roosevelt, in part to instability of the banking and currency system, in part to over-speculation and over-expansion of business enterprises and various other causes, resulting in March 1907 in a general unloading of speculative securities. Values continued to decline, producing a temporary stringency in August 1907, which was followed by the financial crisis of October, when several banking institutions of New York and Brooklyn suspended, to be followed by others in various sections of the country. In spite of the inability of business men to obtain adequate financial accommodations, the number of failures was surprisingly small. The government aided the banks by depositing money, the clearing houses issued certificates, the importations of gold increased and confidence slowly returned, the normal level being reached again late in 1908, though the effects were apparent for a much longer time. There was an acute depression in 1914 which World War I interrupted. Another crisis occurred in 1920-1921 but the world-wide demands for all sorts of commodities to replace war's destruction and the fact that the trades had large reserves to draw upon, prevented the severe shock from tremendously lowered prices which the 1929 crisis produced. The wholesale price-level fell 18-20 per cent on the world market between Oct. 1929 and Oct. 1930 and continued downward in 1931. The crisis was attributed to a whole block of causes, financial as well as political; the complicated political conditions in Europe, South America and China; the shifting of gold holdings among various countries, especially to the Bank of France and the Federal Reserve Banks of the United States; the fall in the silver rate, affecting the purchasing power of one quarter of the world's population; overproduction of raw materials, partly due to good harvests and partly the result of artificial price-fixing; the striking spread of protectionism; the spirit of rampant speculation in the United States. Buyers held back in the expectation of lower prices. Certain countries, particularly France, were disinclined to grant any long credits. It is too soon to pass judg-

ment upon these factors as causes. The business cycle has long been the subject of study by economists and statisticians, yet their causes and prevention are unknown. Psychological factors are believed to be important elements, apparent in over-confidence in one period and vague general fear at another.

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CRISFIELD, Md., city in Somerset County; alt 5 feet, on Tangier Sound, Chesapeake Bay; about 100m SE. of Baltimore; on the Pennsylvania Railroad. Oyster and crab fishing, shucking, packing, refrigeration and shipping are the industries, and there is a terrapin pound. Boats are built here. Pop. (1950) 3,688.

CRISIS, in medicine the turning-point in a disease at which a decided change for the better or the worse takes place. In regular fevers the crisis takes place on certain days, which are called critical days (the 7th, 14th and 21st); sometimes, however, a little sooner or later, according to the climate and the constitution of the patient. The word crisis is also figuratively used for a decisive point in any important affair or business, for instance, in politics and commerce. See also **CRISES**, **ECONOMIC**.

CRISIS, The, a novel by Winston Churchill (q.v.), American author, published in 1901.

An historical novel in the idealistic vein, it deals with the turbulent events and sharp issues of the Civil War years in St. Louis, a time when that city was torn between slavery and antislavery sympathies. These are respectively embodied in a typical Southern heroine, the proud and beautiful Virginia Carvel, and Stephen Brice, a highminded Bostonian of good family but limited financial resources. Other characters, who contribute usefully to a conscientious picture of the times, are the heroine's father, a Southern gentleman of the old school; her first cousin, Clarence Colfax, a hot-blooded cavalier; and the cold, acquisitive, caddish carpetbagger from the North, Eliphalet Hopper. The author's own point of view, which appears to be closer to Unionism, than either Abolition or Slavery, is represented by Judge Whipple, an intense admirer of Abraham Lincoln.

The story deals earnestly and discursively with its significant subject. It was very popular when it appeared, and it continues to be read, its attractions, particularly for the young, including a detailed account of Sherman's March to the Sea, and more or less intimate sketches of Lincoln, Stephen A. Douglas, General Grant, and General Sherman.

CRISIS, The, the general name given to a series of political articles by Thomas Paine. These are 13 in number, exclusive of a "Crisis Extraordinary" and a "Supernumerary Crisis." The first and most famous, published in the *Pennsylvania Journal*, Dec. 19, 1776, began with the famous sentence, "These are the times that try men's souls." It was written during the retreat of Washington across the Delaware, and by order of the commander was read to

groups of his dispirited and suffering soldiers. Its opening sentence was adopted as the watchword of the movement on Trenton, a few days after its publication, and is believed to have inspired much of the courage which won that victory." The 13th, published April 19, 1783, bears the title "Thoughts on the Peace, and the Probable Advantages thereof." It opens with the words, "The times that tried men's souls are over." The pamphlets throughout exhibit political acumen and the common sense for which Paine was remarkable.

CRISP, Charles Frederick, American jurist: b. Sheffield, England, Jan. 29, 1845; d. Atlanta, Ga., Oct. 23, 1896. He came to the United States when a child; served in the Confederate Army, 1861 to 1864; was solicitor general of the southwestern judicial circuit of Georgia from 1872 to 1877, and judge of the superior court of that circuit, 1877 to 1882. He resigned to accept a nomination for Congress, of which body he was a member until his death. From 1891 to 1895 he was speaker of the House.

CRISPI, Francesco, frän-chäs'kô krës'pè, Italian statesman: b. Ribera, Sicily, Oct. 4, 1819; d. Naples, Aug. 11, 1901. He studied law at the University of Palermo, receiving his doctorate at 18, and settled in Naples in 1846. He took part in the Sicilian revolt of 1848, but when the Bourbon government was reinstated fled to Piedmont, then to France and England. In London he became acquainted with Giuseppe Mazzini, with whom he conspired for the freedom of Sicily. After the war of 1859 Crispi returned to Italy, set in motion his plans for insurrection, and in 1860 assisted Giuseppe Garibaldi in the expedition of volunteers for the deliverance of the Two Sicilies (q.v.). In July 1887 he became prime minister and earnestly supported the Triple Alliance of Germany, Italy, and Austria. He was overthrown in 1891, but two years later was recalled to the premiership, an office he held until 1896, when he was deposed after Italy's defeat by the Ethiopians at Aduwa. Crispi's greatness is no longer disputed. His vigorous persistence brought Italy among the Great Powers of Europe and gained for that country a new trust and confidence.

CRISPIN, kris'pîn, and **CRISPINIAN, kris'pîn'i-ân**, Saints, Christian martyrs and patron saints of shoemakers and other workers in leather. It is not certain whether they were brothers. According to legend, the two set out as missionaries of the Christian faith and traveled to Soissons in Gaul, where they made many converts while earning a livelihood by shoemaking. Their festival falls on Oct. 25, the day in 286 or 287 on which they were beheaded by order of Emperor Maximian, during Diocletian's persecution of the Christians.

CRISPUS, Gaius Sallustius. See SALLUST.

CRISTOBAL, krīs-tō'bāl (Span. Cristóbal, krës-tō'vāl), town, Panama Canal Zone, at the Atlantic entrance to the Panama Canal. Capital of Cristobal District, it comprises that part of the city of Colón, Panama, lying within the boundaries of the Canal Zone and upon lands purchased by the United States. Pop. (1940) district, 20,325; town, 826.

CRISTOFORI, krês-tô'fô-rê, Bartolommeo Italian harpsichord maker and reputed originator of the piano: b. Padua, Italy, 1655; d. (probably Florence) 1731. After moving to Florence in his early thirties, he invented a hammer action that permitted variations in both soft (*piano*) and loud (*forte*) tones not possible with the existing harpsichord, and thus developed the *pianoforte*, about the year 1710 or 1711. One of two early pianofortes ascribed to Cristofori, dating back to 1720, is now in the Metropolitan Museum of Art, New York City. See also PIANO.

CRITIAS, krish'i-äs; krit'i-äs, Greek orator, poet, and politician: d. 403 B.C. A pupil of Socrates, he applied himself to the study of eloquence, and Cicero cites him among the great public speakers of that day. Banished from Athens about 407 for some cause not known to us, he retired to Thessaly, where he incited an insurrection among the Penestae, or serfs. Subsequently he visited Sparta and wrote a treatise on the laws and institutions of that republic. Returning to Athens with Lysander, 404 B.C., he was appointed one of the famous Thirty Tyrants (q.v.) set by the Spartans to govern Athens. After a cruel and oppressive use of the power thus conferred upon him, he fell in battle against Thrasybulus and his followers. Plato, who was a relation of his, made him one of the interlocutors in his dialogue "Critias, or the Island of Atlantis."

CRITICAL AND HISTORICAL ESSAYS CONTRIBUTED TO THE EDINBURGH REVIEW. See MACAULAY'S ESSAYS; MACAULAY, THOMAS BABINGTON.

CRITICAL POINT or **CRITICAL STATE**, in *metallurgy*, is a point at which the fall or rise of temperature of a metal or alloy that is being cooled or heated is temporarily retarded because of evolution or absorption of heat resulting from a rearrangement of the molecules, or within the molecules, of the metal. For example, at its two upper critical points, about 1400°C. and 910°C., pure iron changes its crystalline form. At its critical point for magnetism, about 770°C., an intermolecular change occurs: above this temperature iron is almost nonmagnetic; below, it is strongly ferromagnetic. Carbon steel has yet another critical point, the "recalcence point" at about 710°C.: steel is a solid solution of carbon in iron above this temperature, but a mixture of cementite (Fe₃C) and ferrite (pure iron) crystals below.

In *physics and physical chemistry*, the term critical point refers to the state of temperature and pressure at which a liquid and its saturated vapor are indistinguishable, the values of their densities and other physical constants being equal. It was long known that gases could be liquefied more easily at low temperatures, and several gases were liquefied by applying pressure while they were chilled by a freezing mixture of ice and calcium chloride. All efforts to liquefy oxygen, nitrogen, and hydrogen failed, which led to the idea that these might be "fixed" gases that could not become liquid. Thomas Andrews, the Irish physicist and chemist, in his Bakerian lecture for 1869 "On the Continuity of the Gaseous and Liquid States of Matter," showed this view to be erroneous. There exists for every gas a definite temperature above which it cannot be

liquefied by application of pressure, but below which a suitable pressure will convert it into the liquid state. The temperature so defined is called the "critical temperature." The vapor tension of the liquefied gas at its critical temperature is called the "critical pressure" of the gas. The volume occupied by a unit mass of the gas or the liquid at its critical temperature and critical pressure is called the "critical volume."

The critical constants of 17 chemical elements and more than 200 compounds have been determined. Recent measurements of critical temperatures are reliable to a few tenths of one degree. The values of critical pressure and especially of critical volume are less precise. The accompanying table gives the values of critical constants of several gases, including isotopes of hydrogen and helium. The critical temperatures are given in degrees centigrade, and the critical pressures in atmospheres.

CRITICAL TEMPERATURES AND PRESSURES

Substance	Critical temperature (centigrade)	Critical pressure (atmosphere)
Sulphur	1040	116
Aniline	425.6	52.3
Water	374.2	218.3
Chloroform	263.4	54
Ethyl alcohol	243	63.0
Sulphur dioxide	157.5	77.8
Methyl chloride	143.1	65.9
Ammonia (NH ₃)	132.3	111.3
Dichlorodifluoromethane	111.5	39.6
Hydrogen sulphide	100.4	88.9
Hydrogen chloride (HCl)	51.4	81.5
Acetylene	36	61.6
Carbon dioxide	31.0	72.9
Methane	— 82.1	45.8
Oxygen	— 118.4	50.1
Argon	— 122	48.0
Air	— 140.7	37.2
Nitrogen	— 147.0	33.5
Neon	— 228.7	26.9
Hydrogen (D ₂)	— 234.9	16.2
Hydrogen (HD)	— 237.3	14.6
Hydrogen (H ₂)	— 240.3	12.7
Helium (He ⁴)	— 267.9	2.26
Helium (He ³)	— 269.8	1.15

The boiling point of a substance is at the critical temperature if the external pressure upon it is equal to the critical pressure. When the pressure is diminished, the substance boils at a lower temperature. Let us, as an example, convert one liter of carbon dioxide gas at 25°C. and 1 atmosphere pressure into a liquid at 25°C. and 150 atmospheres pressure, keeping the temperature constant as we increase the pressure. Condensation begins at about 60 atmospheres, and the pressure cannot be made greater until all the gas has changed to the liquid state. The change of volume as the gas condenses, while both the temperature and the pressure remain constant, is called a discontinuity.

There is a method by which this discontinuity can be avoided. First heat the gas from 25°C. to 50°C., at 1 atmosphere pressure, and then raise the pressure to 150 atmospheres. This can be done without liquefying the gas, for 50°C. is higher than the critical temperature of carbon dioxide. Then lower the temperature to 25°C., keeping the pressure at 150 atmospheres. No abrupt change of condition is observed during this process of cooling at a pressure higher than the critical pressure. Nevertheless, the carbon dioxide is liquid at 25°C. and 150 atmospheres. The substance is converted from the gaseous state into the liquid state in such a manner that the transi-

tion is imperceptible to the senses, and is not accompanied by any sudden change of density.

HOWARD H. MARVIN,
University of Nebraska.

CRITICISM, the act of clarifying, evaluating, and communicating one's responses to a work of art, is a natural and inevitable part of esthetic experience. While it is stimulated by all the arts, its most ancient and powerful manifestations have been literary. Hence "criticism" ordinarily means "literary criticism" and as such has become a major branch of belles-lettres, in some eyes an art in itself. As old as the Greeks (Aristophanes, Plato, Isocrates, Aristotle, Longinus) and their Roman followers (Cicero, Horace, Petronius, Quintilian), criticism has flourished in every age of literary vitality and has become a particularly exciting and rewarding pursuit in 20th century America.

The problems to which criticism addresses itself may be listed as (1) literary theory, that is, essentially psychological questions of the genesis of the creative impulse, its projection into esthetic perceptions or intentions, its technical expression into esthetic form, and the means of its communication to its audience; (2) literary history—the biographies of authors, the histories of literary genres, conventions, taste, and ideas; (3) the careful elucidation and explication of the artistic content of works of literature together with evaluation (whether personal and impressionistic, relativistic—as sociological, political, etc.—or judicial and absolute) of what is finally found. A purist view might insist that only activities under the third group are legitimately "criticism"; but experience has shown that all three are essential.

Though meaningful work in criticism was done during the Middle Ages and the Renaissance, it did not begin to emerge as an important intellectual enterprise until the "classicist" or "neoclassical" age.

Leading critics were Pierre Corneille, Nicolas Boileau-Despréaux, Voltaire (François Marie Arouet), Jean Baptiste Dubos, Denis Diderot in France; John Dryden, Alexander Pope, Joseph Addison, Francis Hutcheson, David Hume, Samuel Johnson, Edmund Burke, Lord Kames (Henry Home), Hugh Blair, and Archibald Alison in England. The Romantic revolt that followed was spearheaded by Johann Gottfried von Herder, the brothers August Wilhelm and Friedrich von Schlegel, and Johann Wolfgang von Goethe in Germany; in England the great names were William Wordsworth and Samuel Taylor Coleridge, William Hazlitt, Charles Lamb, Thomas De Quincey, Lord Byron, Percy Bysshe Shelley, and Thomas Carlyle. The advancing 19th century made criticism increasingly important; John Ruskin, Matthew Arnold, Thomas Babington Macaulay, and John Stuart Mill came forward in England to be followed by Walter Pater, John Addington Symonds, John Morley, and George Saintsbury at the head of an army of critics. Charles Augustin Sainte-Beuve, Ernest Renan, and Hippolyte Adolphe Taine were similarly the giants in France, Francesco De Sanctis and Benedetto Croce in Italy.

Though many earlier American writers worked with literary theory or dabbled in criticism, the first major American critical work was Edgar Allan Poe's theorizing about poetry and the short story. After Poe, Ralph Waldo Emerson, James Russell Lowell, Walt Whitman, William Dean Howells, and Henry James stood out from the growing crowd of critics. But it was in the 20th century that criticism matured in America. While Thomas Ernest Hulme, Ivor A. Richards, Virginia Woolf, William Empson, and Frank Raymond Leavis were writing in England and Charles Maurras, Paul Valéry,

André Gide, Jacques Maritain, André Breton, and Georges Duhamel in France, in loose alliance with some of them, or quite independently, a number of American schools of criticism arose.

Much influenced by Joel Spingarn and his impressionism, a school of aesthetic salvationists and apocalyptic cultural nationalists grew up around the early Van Wyck Brooks and Randolph Bourne. They were met by an equally energetic school of Neo-Humanists, traditionalists, adherents of judicial criticism by ultimate, absolute standards, many of them professors, who rallied to Irving Babbitt, and Paul Elmer More. Meantime two American expatriates, Ezra Pound and, more significantly, T. S. Eliot, reacted partly to the impulses from the American schools and partly to European influences, and laid the groundwork for what eventually was popularized as the New Criticism. Functioning largely through the "little magazines," this movement gathered recruits from many camps and came, in the 1940's, to dominate American criticism. John Crowe Ransom, Cleanth Brooks, R. P. Blackmur, Allen Tate, and Yvor Winters led the New Critics, whose primary effort was to prove the autonomy and power of the aesthetic imagination by painstaking analyses. Their principal opposition before World War II came from the "proletarian" critics. Newton Arvin, Kenneth Burke, James T. Farrell, and Edmund Wilson were foremost in relating literature to wide socio-economic factors on a more or less doctrinaire Marxian basis. Each of these schools has in some sense fulfilled itself, and we may look for new developments in criticism.

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EDWIN H. CADY.

CRITIQUE OF PURE REASON, The. *The Critique of Pure Reason (Kritik der reinen Vernunft)* is the most important work of the German philosopher Immanuel Kant (q.v.). It is perhaps the most famous book in modern philosophy, and has exercised much influence ever since its publication in 1781.

One reason for this importance is that, in it, Kant mediated between the two opposed philosophic movements which preceded; the Continental rationalism of René Descartes, Baruch Spinoza and Gottfried Wilhelm von Leibnitz, and the British empiricism of John Locke, George Berkeley, and David Hume. Rationalism had maintained that all knowledge must be based on reason and conception, and that sense perception is a secondary and insufficient ground for real knowledge. It had also claimed knowledge not only of the visible world but of realities beyond sense, such as God and our own immortal souls. In contrast, empiricism had maintained that all knowledge must derive from sense; and Hume

had come to the skeptical conclusion that there can be no theoretically sufficient ground for such knowledge at all.

Kant took the third position that knowledge requires both sense perception and conceptual understanding. Concepts without sense intuitions are empty; and intuitions without concepts are blind. But by bringing intuitions of sense under concepts of the understanding, valid knowledge and science are possible; and there is an answer to Hume's skepticism.

Kant further criticizes the rationalists' claim to know transcendent realities. If knowledge requires sense perception as well as conception, then we cannot know what lies beyond sense. However, he held that we have a rational ground for believing in God, and in our nature as immortal and as free moral agents. (This last point is only outlined in the *Critique of Pure Reason*, full development of it is found in his later-written *Critique of Practical Reason*.)

Perhaps a main reason for the wide influence of the *Critique of Pure Reason* lies in just these facts: that it offers an impressive defense of knowledge and science against skepticism while leaving room for a rational ground of moral and religious convictions, outside the scope of science.

The first half of the book is occupied with the defense and explanation of the possibility of valid knowledge. A main premise for this is Kant's distinction between ultimate realities (things in themselves) and phenomena (things as they appear to human minds). What ultimate reality is like, apart from our capacity to perceive and understand it, we have no means of knowing; and no hypothesis about it can be either proved or disproved. The world we know must be bounded by our limitations of perception and imagination, and our power to grasp conceptually, and what falls within these limits is the world of phenomena. It is this phenomenal world of things as they appear to us, and not the imperceptible ultimate realities, to which knowledge and science are addressed.

But just this limitation of phenomena to what we can apprehend assures us that the world we discover in experience will have certain reliable characteristics. If we can sense only in certain ways, and conceptually understand only in certain ways, then we know *a priori* (with certainty and in advance) that all the phenomena we shall ever encounter in our experience will conform to these modes of our possible apprehension.

The first set of such conditions of possible human experience—the forms of our sense intuition—Kant discusses in the section headed "Transcendental Aesthetic." He points out that we can neither sense nor imagine anything except in the form of the three-way spread of space and of a one-dimensional on-going time. These limitations of our intuition assure, Kant says, the certainty of mathematics. Whatever we can discover by sense must conform to the principles of geometry. And since any collection or array of things we can count, one after another in time, will answer to all the laws of arithmetic, we also know *a priori* that arithmetic principles will hold of anything we can ever find in experience.

In the section headed "Transcendental Analytic," Kant discusses the function of conceptual understanding as setting similar *a priori* conditions of all human experience, and by so doing assuring certain principles which are basic for all physical science. In the first place, all human

experience—in contrast to that of some lowly creature which had sense-feelings but could not think—is characterized by the fact that what drops out of sight still does not drop out of mind. In recognizing any object or grasping any series of events, we synthesize—think together—something retained from past experience along with what is now presented. To see a house, for example, we must think together the four sides of it as being simultaneously there, although we cannot sense them simultaneously but only one after the other. To this general form which all human experience has as a thinking together of past and present, Kant gives the name “the transcendental unity of apperception.” The more specific modes of such synthetic thinking he calls the “categories” or “pure concepts of the understanding.” He offers a list of these categories, derived from the logical modes of judgment. They represent the basic ways in which alone we can think objects and events. For example, if we apprehend what we see as the color of an apple, we are attributing the sensed color to an enduring thing, the apple; and this mode of our thinking is that of “substance and attribute.” But if we observe that a building is now destroyed because of an explosion, we are thinking in the mode of “cause and effect.” That our experience as revealing objects and events reflects these categorical modes of our understanding, has the consequence that all phenomena are necessarily subject to basic principles, such as that every appearance must be an attribute of some substance, and that for every event which happens, there must be some cause on which it follows according to a rule. It is such *a priori* principles which are presupposed by all physical science and make possible the validity of it.

In the section headed “Transcendental Dialectic,” Kant discusses the problematic things which lie beyond sense—“noumena” as he calls them. Our conceptions of them he labels “Ideas of Pure Reason.” As already indicated, he maintains that we can have no knowledge of such transcendent entities; and it is here that he criticizes the rationalistic claims to such knowledge. He recognizes, however, that such ideas inevitably occur to any rational mind; and he seeks to explain why. It is the function of reason to look for ever higher generalizations and more comprehensive concepts. It assumes that there is an explanation of *everything*: that for whatever is given as conditioned, there is the totality of its conditions. But this thought leads to puzzles which Kant calls “antinomies.” For example, what I now observe has a cause—that, my understanding tells me. And the cause of it has its cause, and this in turn has a cause, and so on. But if this series of causes of what I see is infinite, how could all of them have happened already, one after the other? So I think of some absolute beginning in a first cause. But if I think of anything as the first cause, what made it happen when it did? We cannot clearly imagine a complete causal series, either with or without a beginning. So also, we cannot imagine the whole world as either finite or infinite, or the unitary soul as subject of all our experience, or God as the ground of all things.

Though Kant denies any possible knowledge of objects corresponding to such ideas, he nevertheless ascribes to the ideas themselves a valid function, even for science itself. They direct our thought to the desirable progress of our under-

standing in the direction of ever higher generalities and more comprehensive, more detailed, and more connected knowledge; and remind us that the task of science is forever incomplete. This function he calls “the regulative use of the ideas of pure reason.”

The authoritative German text of the *Kritik der reinen Vernunft* is that found in the complete edition of Kant's works, brought out by the Prussian Academy of Natural Science (Berlin and Leipzig, 1902–1922). The best German commentaries are those of Hermann Cohen, Erich Adickes, and Ernst Cassirer. The fully satisfactory translations in English are those of Max Muller (New York 1896) and Norman Kemp Smith (New York 1929). The best commentary in English is that of Norman Kemp Smith. See also ETHICS—Recent Modern; PHILOSOPHY, HISTORY OF.

C. I. LEWIS.

CRITIUS AND NESIOTES, Greek sculptors of the late 5th century B.C. Their most famous work is a group of the tyrannicides Harmodius and Aristogiton which stood on the agora at Athens. A Roman copy exists in Naples, and copies of the heads elsewhere.

CRITO, kri'tō. (1) Athenian philosopher: fl. 400 B.C. He was a wealthy friend and disciple of Socrates, whom he helped financially and whose escape from prison he argued for and vainly planned. In Plato's dialogue bearing Crito's name, Socrates explains his reasons for not trying to escape and accepting death instead.

(2) Athenian poet of the New Comedy: fl. 170 B.C. Of his plays three titles and eight lines remain.

(3) Neo-Pythagorean philosopher: fl. 1st century B.C. or A.D. Of his treatise *On Providence and Good Fortune* only three fragments survive.

(4) Greek physician (full name TRITUS STATILIUS CRITO): fl. 100 A.D. He practiced at Emperor Trajan's court. Large portions of his studies on cosmetics and on drugs are contained in Galen's medical works and some fragments are preserved by other authors.

CRITOLAUS, krit-ō-lā'ūs. (1) Greek philosopher: fl. 2d century B.C. A native of Phaselis in Lycia, he migrated to Athens, Greece, where he became leader of the Peripatetic school. In 155 with two other philosophers Critolaus represented Athens on a political mission to Rome, where the trio's lectures inspired among intellectual patricians an abiding interest in philosophy, but led to Critolaus' dismissal from Rome by Cato the Elder.

(2) Greek politician: d. 146 B.C. As general of the Achaean League and demagogic enemy of the Roman protectorate over Greece, he incited the Achaeans into war with the Romans. In 146 B.C. the Romans routed the league's large army at Scarphaea in Locris—near which Critolaus soon afterward died—and within the year ended the political independence of Greece.

CRITTENDEN, George Bibb, American military officer: b. Russellville, Ky., March 20, 1812; d. Danville, Nov. 27, 1880. He graduated from the United States Military Academy in 1832, and he then served as an officer in the Mexican War, rising to the rank of lieutenant colonel. He joined the Confederacy at the out-

break of the Civil War, became a brigadier general and suffered defeat at Mill Springs, Ky., in 1862. He was kept under arrest in consequence and resigned his commission the following year. Later he served as a volunteer. From 1867-1871 he was state librarian of Kentucky.

CRITTENDEN, John Jordan, American legislator: b. Woodford County, Ky., Sept. 10, 1787; d. Frankfort, Ky., July 26, 1863. He was graduated at William and Mary College in 1807. In 1816 he became a member of the state legislature; in 1817 was elected to the United States Senate; and from 1827-1829 was United States district attorney. He was subsequently re-elected twice to the United States Senate. In 1848 he became governor of Kentucky. He was again attorney general under President Millard Fillmore and in 1855 was sent a fourth time to the Senate. In the Senate he urged unsuccessfully his famous compromise. After 1861 he served for one year in the House, and in that body also strove for the supremacy of the Constitution. Through his influence Kentucky remained loyal to the Union in the Civil War. See also **CRITTENDEN COMPROMISE**.

CRITTENDEN, Thomas Leonidas, American military officer: b. Russellville, Ky., May 15, 1819; d. Annandale, N. Y., Oct. 23, 1893. He was a son of John J. Crittenden (q.v.) and was educated for the law. In 1842 he became state attorney for Kentucky; served as an officer in the Mexican War and in 1849 was appointed consul at Liverpool. On the outbreak of the Civil War he became brigadier general of volunteers and in 1862 was promoted to major general. He distinguished himself at Shiloh, Stone River, and Chickamauga. He was retired in 1881.

CRITTENDEN COMPROMISE. A constitutional amendment proposed in 1860-1861 by John J. Crittenden (q.v.) of Kentucky, which represented the last desperate effort of the Southern Union Party to avoid secession and war. Under the terms of this amendment, the boundary between the free and slave states would have been set in line with the Missouri Compromise (q.v.), and the federal power committed to full and permanent support of slavery where it existed. Four resolutions were appended to the basic proposals, declaring the Fugitive Slave Act constitutional, urging repeal of the state personal liberty laws, promising suppression of two specially obnoxious features of the Fugitive Slave Law, and rigorous suppression of the outside slave trade. The legislatures of Virginia, Kentucky, Tennessee, and New Jersey instructed their delegates to the Peace Conference of 1861 to support the compromise. In Congress, Crittenden continued to press it during the session. It was lost in the House on Jan. 14, 1861, by 113 to 80; and in the Senate, on March 2, by 20 to 19. War became inevitable.

CRITTENTON, krīt'n-tūn, Charles Nelson, American philanthropist: b. Henderson, Jefferson County, N. Y., Feb. 20, 1833; d. San Francisco, Calif., Nov. 16, 1909. He engaged in the drug business in New York in 1861; but after 1882, when his four-year-old daughter Florence died, he devoted his time and wealth to the establishment of Florence Crittenton homes for homeless and unfortunate girls and their infant

children. In 1895 the National Florence Crittenton Mission was incorporated to carry on this work. Of these mission homes 75 were organized in Mr. Crittenton's lifetime in all the larger cities of the United States and in Marseille, France; Tokyo, Japan; Shanghai, China; Mexico City, Mexico.

CROATAN, krō-tān', a sound between the coast of Dare County, N. C., and Roanoke Island, in the channel joining Albemarle Sound with Pamlico Sound.

CROATIA, krō-ā'shī-ā (Slav. HRVATSKA), one of the six federal republics which constitute the Federal Peoples Republic of Yugoslavia. Its official name is Peoples Republic of Croatia. Covering an area of 21,701 square miles, the country occupies the northwestern and western sectors of Yugoslavia. It is U-shaped in form, the northern arm bordering Hungary and the southern stretching along the Adriatic Sea. Geographically it is delimited by 14° to 18°2' west longitude, and 42°6' to 46°30' north latitude.

Historically, Croatia is composed of three main parts: Croatia proper, Slavonia, and Dalmatia. According to the census of March 31, 1953, the population is 3,913,753, of whom 79 per cent are Croats, 14.5 per cent Serbs, and the remainder are national minorities—Hungarians, Italians, and others. The capital city is Zagreb (German Agram), with a population of 354,000. Other important cities are: Rijeka (Fiume), 75,000, a well-known harbor in the northern Adriatic; Split, 75,000, the capital of Dalmatia; Osijek, 55,000, the capital of Slavonia; Karlovac, 24,000, an important industrial center in upper Croatia; Pula (Pola), 28,000, a military port and arsenal in Istria; Varaždin, 18,000, a historical city in northern Croatia; and Dubrovnik (Ragusa), 17,000, world-famous tourist resort and historical town in southern Dalmatia.

Relief and Climate.—Croatia is predominantly highland, 70 per cent of the country being over 1,000 feet above sea level. While the north is characterized by the two rich agricultural valleys of the Sava and Drava rivers, the south is more mountainous and less fertile. The north and the mountain regions have a Continental climate, while the climate along the Adriatic coast is Mediterranean.

Social and Economic Conditions.—Socio-economically Croatia is predominantly an agrarian country, the peasantry constituting 75 per cent of the population. The agrarian reforms of 1919-1931, and of 1945, have distributed the land among the individual peasants, limiting the size of the individual holdings to 87 acres of arable land. Although since 1945 the formation of collective farms of the *kolkhoz* type and the socialization of agriculture have been promoted, individual peasant farms are nevertheless still largely prevailing. The social and economic conditions of the peasants in the north differ considerably from those in the south. In the north, the peasant farmers of Slavonia, generally speaking, are wealthy, while those of the heavily populated hilly areas, like Hrvatsko Zagorje, or those in Dalmatia in the south, hardly earn their living. Land utilization is distributed as follows: arable land 26.7 per cent; meadows and pastures 30.2 per cent; forests 33.5 per cent; vineyards and orchards 4 per cent; and unproductive land 4.3 per cent. The principal crops are corn, wheat,

oats, rye, and barley. Industrial plants, such as flax, hemp, sunflower, soya beans, sugar beet, and chicory, are grown mostly in Slavonia, while in Dalmatia oil and fig orchards are greatly cultivated. Animal husbandry has been developed in Slavonia with a special type of breed in the Sava Valley and the cattle ranches located in the Valley of Drava. Hog breeding, poultry farms, and apiculture are spread all over the country. In Dalmatia, mules and donkeys are used as draft animals instead of horses and oxen.

The infant period of Croatian industry dates back to the last decades of the 19th century but between World Wars I and II the industry expanded considerably. After World War II the industrialization of the country was fostered by the new regime which has given preference to heavy industry. Abundant forests favor timber production and there are sawmills scattered throughout the country. Agricultural industries comprise: sugar factories in Osijek and Zupanja; vegetable oil factories in Osijek and Zagreb; meat-packing plants in Petrinja, Zagreb, Križevci, and Bjelovar; breweries in Zagreb and Karlovac; dairy industries and alcohol distilleries located throughout northern Croatia and Slavonia; and fish canneries in Split, Komiza, and Zadar. The centers of the heavy industry—iron and steel works, machine and tool factories, and concrete factories—are Zagreb, Rijeka, Sisak, Karlovac, Split, Osijek, and Slavonski Brod (Brod), while the centers of the textile and leather industries are Varaždin, Duga Resa, Vukovar, and Zagreb.

The country has substantial stocks of lignite in Hrvatsko Zagorje, Raša (Istria), and northern Dalmatia, while bauxite is exploited in Dalmatia. The estimated production of lignite is approximately 1.2 million tons yearly. Limited quantities of iron ore are exploited in Petrova Gora, and although there are oilfields located in Slavonia and Medjumurje, the petroleum production is scant.

Hydroelectric plants have been constructed on the Kupa River near Karlovac, in Tribalj, and on the Krka and Cetina rivers in Dalmatia.

The first railroad was built in 1861, and since then the railroad system has expanded appreciably. The capital city is connected with all parts of the country, the main lines running east and west from Belgrade to Ljubljana, and north-south, between Vienna and Budapest to Rijeka and Split. The roads are mostly gravel although some hard-surfaced roads have been built. Coastal navigation is well organized, and is operated by state companies with shipyards in Rijeka, Kraljevica, and Split. The tourist traffic is increasing and, under normal conditions, can be of great economic importance to the country due to the extremely favorable geographical position of Dalmatia with its scenic beauty and attraction. The most important tourist centers are: Opatija (Abbazia) and Crikvenica in the Croatian littoral, and Rab, Hvar, Makarska, Korčula, and Dubrovnik in Dalmatia.

History and Government.—The Croats, a branch of the Slavic peoples, settled on their present territory in the 6th to 8th centuries. In the 9th century the first Croatian dukedom was established in Dalmatia, and in 852 its ruler Trpimir took the name of the duke of the Croats as marked in the first historical document bearing the Croatian name. In 910, Trpimir's successor, Tomislav, became the ruling prince, and in 925 he was crowned as the first Croatian king. The

kingdom founded by Tomislav embraced approximately the same territory as present Croatia, comprising the coastal provinces and the northern regions then called Pannonia. Tomislav was the founder of the Croatian national dynasty, and one of his successors, Petar Krešimir (1058–1074), succeeded in enlarging his kingdom, and proclaimed himself the king of Croatia and Dalmatia.

The era of the Croatian national dynasty is noted for continuous struggles of the two opposing groups: one advocating closer ties with and concessions to the pope and the Roman population of the littoral towns; the other, the nationalist group, defending zealously the old Croatian customs, rights, and privileges, especially those obtained in the Catholic Church, against Latin supremacy. King Dimitri Zvonimir (1076–1089), in the fight for the throne, accepted his royal insignia from Pope Gregory VII and thus became his vassal, but was killed soon after when attempting to lead the people into the war on foreign soil. Zvonimir was married to Lepa, sister of the Hungarian King Ladislas I, who after the death of his brother-in-law claimed the Croatian throne, and was supported in his endeavors by a part of Croatian nobility. The other group of Croatian nobles elected Petar Svačić, the last king of Croatian blood, who fell in the Battle of Petrova Gora in 1097 while defending his regime. In 1102, the representatives of the 12 Croatian tribes, and the Hungarian ruler Koloman (Kálmán) signed the *Pacta Conventa*, an interstate agreement, thus establishing the personal union between the two kingdoms, Croatia and Hungary.

As a consequence of this event, the center of the Croatian political and socio-cultural life began to shift from Dalmatia, the cradle of the Croatian state, to northern Croatia where, in 1094, a diocese had been established in the town of Zagreb which became in subsequent centuries the political and cultural center of the Croatian people. During the period from 1102 to 1527, Croatia was ruled by various dynasties: first by the Árpáds until 1301, then by the Angevins in the 14th century, and finally by the Polish dynasty of the Jagellos. At two different periods during this time—in the 14th and in the 15th century, under Stephen Tvrtko Kotromanić (r. 1353–1391) and Matthias Corvinus (r. 1458–1490)—Croatia was tied with neighboring Bosnia by strong constitutional links. When in the Battle of Mohács (1526), Louis II Jagello perished, the Croatian nobility elected Ferdinand of Habsburg as the king of Croatia, whose house ruled in Croatia until the end of World War I.

From the end of the 15th century until the beginning of the 18th century, the Croats were engaged in continuous battles against the invading Turks who, by the end of the 16th century, had conquered almost the whole of the country except for its northwestern part. At the same time the feudal burdens imposed by the Croatian landlords became unbearable for the peasants who repeatedly revolted demanding the reinstitution of the "Old Justice," that is, those liberties and freedoms which they had enjoyed in the pre-feudal era. The most famous of these revolts was that led by Matija Gubec, a peasant from Stubica in northern Croatia, in 1573.

The modern political history of Croatia started in the third decade of the 19th century, when the Croatian National Revival was generated by Ljudevit Gaj and his associates. In the revolu-

tionary year of 1848, the Croatian ban, Josip Jelačić, defended the Habsburg cause against the insurgent Magyars; but after the Hungarian resistance was crushed, instead of the promised freedom in Croatia as well as in Hungary, German absolutism was introduced. Defeated in 1866, Austria was compelled to compromise in 1867 with Hungary, who in turn made the compromise (*nagodba*) with Croatia in 1868. By this compromise, Croatia and Slavonia became an autonomous kingdom among the countries of St. Stephen's crown, with broad political, economic, and cultural rights. Dalmatia, which had been promised unification with Croatia and Slavonia, was forced to remain a separate province in the Austrian part of the dual monarchy.

The Compromise of 1868 became, in subsequent decades, the main object of dispute among Croatian political groups. While the Union Party defended the compromise, the National Party led by Bishop Joseph Georg Strossmayer, acknowledged it only in principle, but requested substantial changes in its provisions. The third party, the Croatian Party of the right, under the leadership of Ante Starčević, repudiated the compromise and demanded the establishment of a Croatian independent state. In 1904 a new party was born, the Croatian Peasant Party founded by the brothers Ante and Stefan Radić, whose aim was the organization of the peasantry, the struggle for social justice, and the realization of the political rights of the Croatian people. On Oct. 29, 1918, with the downfall of the Dual Monarchy, the Croatian Parliament in Zagreb proclaimed the independence of Croatia, and severed all the constitutional ties with Hungary and Austria. On Dec. 1, 1918, the union of Croatia with other southern Slav countries was proclaimed, and thus the Kingdom of the Serbs, Croats and Slovenes (since 1931 called Yugoslavia) was established.

Croatian history in the period between World Wars I and II is noted by the constant and persistent struggle against state centralism imposed by the Serbian ruling groups. By the Constitution of Vidovdan, of June 28, 1921, Croatia was first partitioned into six administrative departments (*oblasts*) which was later changed by King Alexander's Constitution of Sept. 3, 1931, into two provinces called *banovinas*—Savska and Primorska (Primorje). The main champion in this fight against Belgrade centralism was the Croatian Peasant Party which, after 1920, on all elections polled the overwhelming majority of Croatian votes. In 1932, under the influence of European totalitarianism, one group of Croatian Nationalists founded the Ustaši movement, demanding total separation of Croatia from the Yugoslav state. During this period the Communist Party was illegal and insignificant in its number of followers, but was nevertheless determined ideologically and well organized in the underground.

On Aug. 26, 1939, an agreement (*sporazum*) was reached between the Croatian Peasant Party, headed by Dr. Vladimir Maček, the Yugoslav regency, and several Serbian political groups; by this agreement Croatia and Dalmatia were united into one autonomous province called the Banovina of Croatia. Croatia's territory was increased by the addition of several districts of Bosnia and Hercegovina predominantly populated by a Croatian Catholic population. Although the agreement was under violent attack from both

Croatian Nationalists and dissatisfied Serbian groups, it nevertheless was accepted in principle, at home and abroad, by all moderate elements as a correct step toward the final settlement of the Serbo-Croatian dispute. With the German invasion of Yugoslavia on April 10, 1941, the "Independent State of Croatia" was proclaimed in Zagreb by the Ustaši leader, Ante Pavelić, who became the head of the new state. While Bosnia and Hercegovina were formally incorporated in Croatia, almost the whole of Dalmatia and the Croatian littoral had to be ceded to Italy by the Rome protocols of May 18, 1941. With the establishment of the Federal Peoples Republic of Yugoslavia in 1945, Istria, several islands in the Adriatic, and Baranja were included in the Republic of Croatia, while the Bosnian and Hercegovinian districts were detached.

Situated on a crossroad, and surrounded by powerful but seldom friendly neighbors, the history of the Croatian people has been a sequence of continuous struggles for survival and self-preservation; but in spite of all geopolitical odds and historical misfortunes, their continued presence is the proof of their perseverance and vitality.

Culture, Education, and Art.—Because of its situation on the crossway of various cultural trends, the Croatian culture is not uniform. While the north was largely influenced by German culture, in Dalmatia the Italian cultural trends were of preponderant significance. Finally, those Croats who live in Bosnia and Hercegovina came under the influence of the Byzantine and Moslem civilizations. Generally speaking, Western culture has left a strong imprint on Croatian cultural life as a whole which has been accentuated by the fact that the overwhelming majority of the Croats, almost 4 million, belong to the Roman Catholic Church.

Education is state controlled and is compulsory until the age of 14. In larger towns one or more high schools of European type offer higher training, while numerous special middle schools organized on the German or the Russian pattern provide technical preparation. The University of Zagreb was founded in 1619 as a college of philosophy, theology, and law by the Pauline Order in Lepoglava. In the 18th century it was transferred to Zagreb, and in 1874 was organized as a modern university having today seven departments and a great number of scientific institutes. The Adriatic Institute in Split leads the research pertinent to the phenomena of the Adriatic Sea.

The first Croatian book, a missal, was printed in 1483, while the Croatian classic literature began in Dalmatia, particularly in Dubrovnik and Split, in the first decades of the 16th century and flourished to the end of the 17th century. Marko Marulić (1450–1524), Petar Hektorović (1487–1527), Hanibal Lucić (1485–1553) and Ivan Gundulić (1589–1638) were the most prominent writers of this period.

The first literary works in northern Croatia were created in the 17th century, but the modern Croatian literature evolved *pari passu* with the national revival in the 19th century, romanticism and realism being equally represented. Ivan Mažuranić (1814–1890), Petar Preradović (1818–1872), and Silvije Strahimir Kranjčević (1865–1908) are the best known poets of this period, while August Šenoa (1838–1881), Eugen Kumičić (1850–1904), Antun Kovačić (1854–1889), Josip Kozarac (1858–1906), and August

Matoš (1873–1914), are the outstanding novelists.

Though a small nation, the Croats were in the past, and are today, very productive in the arts. The earliest Croatian monuments date from the period of the national dynasty, the oldest being the Church of the Cross in Nin (Dalmatia), dating from the last decades of the 8th century. The churches and the monasteries in Dalmatia, and the tombstones of Bosnia, evidence the creative spirit of the early Croatian artists.

In modern times the Croatian sculptor Ivan Meštrović (1883–) has achieved world renown, while other outstanding Croatian artists include: in sculpture, Antun Augustinčić (1900–), Robert Franges-Mihanović (1872–), and Voja Radauš (1895–); and in painting, Vlaho Bukovac (1855–1922), Celestin Medović (1859–1921), Ljubo Babić (1890–), and Joso Kljaković (1889–). Among the best known older composers in Croatia are: Vatroslav Lisinski (1819–1854), the composer of the first Croatian opera *Porin*, and Ivan Zajc (1831–1914), the composer of the popular opera *Nikola Šubić Zrinski*, while the more famous contemporary composers include, Krešimir Baranović (1894–), Jakov Gotovac (1895–), and Fran Lothka (1891–).

BRANKO M. PEŠELJ,
Associate, Mid-European Studies Center, New
York City.

CROCE, krô'châ, **Benedetto**, Italian philosopher: b. Pescasseroli, Aquila Province, Italy, Feb. 25, 1866; d. Naples, Nov. 20, 1952. He was sent at the age of nine to a Catholic boarding-school. During the course of his studies he lost his religious faith. Later, however, at Rome University, where he read moral philosophy, he found in the theory of the "ought to be" as opposed to the "is" the means of recovering his faith in life.

In 1886 he returned to Naples, where he lived until his death, and set himself to a study of political economy which resulted in a profound criticism of the Marxian doctrine. After a period of deep meditation, he started in 1902 his famous journal *La Critica* and published his *Aesthetic as the Science of Expression*, in which was formulated in embryo his philosophic system. His *Logic as the Science of Pure Concept*, *Philosophy of the Practical*, and *History, Its Theory and Practice* followed; and in these four volumes, which he united under the general title of *Philosophy of the Spirit*, Croce sets out his whole philosophy.

His system is based on an idealistic conception of reality, in which the real is seen as a dialectic of the spirit and nature is reduced to a mere aspect of this dialectic. Spirit, universal and eternal, which is brought into being through history, is conceived as a unity of four distinct and distinguishable, yet articulated, "grades," each linked to the other and conditioned by this contact in what Croce calls the "dialectic of distinction." These grades or stages of the spirit are further divided into two categories. On the one hand, there are the two grades which operate on the theoretical plane: art, visualized as pure intuition, the "dawn" form of knowledge, an a priori synthesis between content and form, in which one can recognize the qualities of lyricism and completeness; and philosophy, or logic conceived as the science of pure concept, the methodological stage in history, based on an a priori

synthesis between the universal and the individual "judgments." While on the other hand, there are the two grades which operate on the practical plane: economics, which expresses the stage of utility and forms the substance of politics; and ethics, which transmutes the stage of utility and elevates it to the realm of the universal. Through the interplay of the separate dialectics, therefore, theory and practice are integrated in the unity of the spirit. Nevertheless, each individual grade of the spirit draws life from its own internal dialectic which is, in the Hegelian sense, a "dialectic of opposition" and which resolves itself in an a priori synthesis. Thus, the a priori synthesis of the Kantian philosophy remains the basis for this grandiose and complex idealism.

In his *History, Its Theory and Practice*, Croce further enlarges the analysis of the grade of philosophy. Here, he considers the a priori synthesis of logic as a manifestation of the historical judgment and so identifies philosophy with history. History is, thus, the concrete expression of the individual judgment as it at once penetrates and forms reality.

Other important works are his *Saggio sullo Hegel*, *Saggio sul G. Vico*, *Nuovi Saggi di Estetica*, *Estetica e Politica*, *La Storia come Pensiero e come Azione*, *Il Carattere della Filosofia moderna*. As a result of a deep study of the validity of his theory, he produced a vast series of critical essays on the history and literature of many countries.

He also wrote histories of Italy and of Europe, both of which appeared during fascism. Because of his worldwide reputation, however, that government did not dare to ban either of these works, despite their liberalism.

A great philosopher and critic, an indefatigable worker and a forceful personality, Croce has left teachings of the greatest importance to the moral and social knowledge of man.

PIERO FOSSI,
Doctor of Philosophy, Florence, Italy.

CROCIDOLITE, krô-sid'ô-lit, a mineral of the amphibole group composed of long, delicate fibers and also occurring massive and earthy, and then called abriachanite. It has the formula $\text{NaFe}(\text{SiO}_3)_2\text{FeSiO}_3$, part of the iron being frequently replaced by magnesium and calcium and part of the sodium by hydrogen. The mineral has a hardness of 4 and a specific gravity of about 3.25. The fibrous varieties have a silky luster and vary from blue to green. One of the chief sources of crocidolite is in Griqualand, South Africa. See also ASBESTOS.

CROCKER, Charles, American capitalist: b. Troy, N. Y., Sept. 16, 1822; d. Monterey, Calif., Aug. 14, 1888. He received a common school education and went to California in 1850, where he opened a store. In 1860 he was elected to the state legislature. With Leland Stanford, Mark Hopkins, and Collis P. Huntington, he projected and completed the Central Pacific Railroad.

CROCKETT, krök'ët, David, American pioneer: b. near Limestone, Washington County, Tenn., Aug. 17, 1786; d. the Alamo, Texas, March 6, 1836. He had little formal schooling, and adapted himself early to the life of a farmer and hunter. A pioneer in the development of western Tennessee, he served as a scout for Gen. Andrew Jackson in the Creek War (1813–

1814) and later was made a colonel in the Tennessee militia. In 1821 and again in 1823 he was elected to the Tennessee legislature, and in 1826 was persuaded to run for Congress as the representative from what is now Gibson County, serving for two terms (1827-1831). His opposition to President Jackson's Indian removal bill lost him the 1830 election, but he was returned to Washington for the 23d Congress (1833-1835). A natural shrewdness and a ready wit gained him a wide following, but his divergence from the Democratic Party line cost him his seat in the following election. In February 1836 he joined the Texans in their war against Mexico, and was one of the 187 defenders of the Alamo slain by the forces of the Mexican general, Antonio López de Santa Anna, on March 6, 1836.

The most authentic of the writings attributed to him are *A Narrative of the Life of David Crockett* (1834) and *An Account of Colonel Crockett's Tour to the North and Down East* (1834), both of which were probably dictated.

Consult Seitz, Don C., "David Crockett—who died for Texas" *Uncommon Americans* (Indianapolis 1925); Crockett, David, *The Adventures of Davy Crockett Told Mostly by Himself* (New York 1934); Rourke, Constance, *Davy Crockett* (New York 1934).

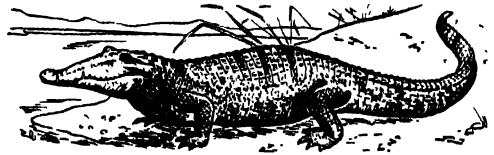
CROCKETT, Samuel Rutherford, Scottish novelist: b. Little Duchrae, New Galloway, Scotland, Sept. 24, 1860; d. Avignon, France, April 21, 1914. Educated at Edinburgh University, he entered the Free Church of Scotland ministry in 1886, and became pastor at Penicuik, Midlothian. The success of his first literary effort, *Dulce Cor: the Poems of Ford Bereton* in 1886 and of *The Stickit Minister* (1893), a series of essays, encouraged him to resign from the ministry in 1895 and to devote himself to a career in writing. He subsequently produced almost 50 novels, using as his locale his native Galloway in the tradition of the "Kailyard School" of which he was one of the foremost exponents together with Ian Maclaren and James M. Barrie. Other of his works are *The Raiders* (1894), *The Lilac Sunbonnet* (1894), *The Standard Bearer* (1898), *The Dark o' the Moon* (1902), *Maid Margaret* (1905), *The White Plumes of Navarre* (1909), and *Sandy's Love Affair* (1913).

CROCKETT, city, Texas, and Houston County seat. Located in east central Texas between the Trinity and Neches rivers. Named for Davy Crockett of Alamo fame, it was incorporated in 1837, and is the fifth-oldest town in Texas. It is 120 miles north of Houston and is served by the Missouri Pacific Railroad besides being crossed by seven major highways. The mean annual temperature is 69 degrees, the average rainfall, 45.39 inches, and the altitude, 350 feet. It is governed by a city council, and is a trade center for lumber and cotton, with cottonseed oil and lumber mills, woodworking plants, and cotton gins. There is also diversified farming. It is the seat of Mary Allen College, and is notable for the presence of a replica of the first Spanish mission in East Texas (1690). Pop. (1950) 5,932.

CROCODYLE, any one of fourteen members of the genera *Crocodylus* or *Osteolaemus* of the order Crocodylia (q.v.). Crocodiles, together with the Asiatic garials, are readily distinguished from their allies, the caimans (South

and Central America) and alligators (southeastern North America and China), by the enlarged fourth lower tooth fitting into an emargination of the upper jaw instead of into a cavity as with the alligators, so that it shows conspicuously when the mouth is closed. Though the narrow snout of the American crocodile distinguishes it from the very broad-snouted American alligator, the character is not of universal application, for several crocodile species have broad snouts. In true crocodiles (*Crocodylus*), as distinct from the African *Osteolaemus* and the alligators, but not the caimans, the nasal opening in the skull is not divided by a forward prolongation of the nasal bones. While the valvular nostrils are situated on the extremity of the snout to facilitate breathing when the rest of the reptile is submerged, the internal nasal opening of recent crocodiles is set far back on the palate where it connects with the windpipe. This arrangement enables a crocodile to breathe when its jaws are open underwater to hold its prey. The ear openings also can be closed.

Crocodiles swim by means of the webbed feet and lateral movements of the powerful compressed tail, on whose upper surface is a double series of horny lobes that converge to form a single keel on the distal half. The tail serves



Crocodile (*Crocodylus americanus*).

also as a weapon, being employed to strike the legs from under any unsuspecting creature that approaches too near the water's edge—the victim is then quickly seized, dragged in, and held under until drowned. If too bulky for immediate dismemberment, the corpse is stowed among roots or beneath a river bank until sufficiently decomposed to be torn apart and swallowed. The teeth of a crocodile being ill-adapted for mastication, the food is ground by the mass of pebbles usually carried in the stomach for the purpose.

Most crocodiles excavate a hole on land in which to deposit their numerous hard-shelled eggs, each about the size of a duck's. A few species like the Estuarine Crocodile (*C. porosus*) raise dome-shaped nests of vegetable debris whose fermentation assists incubation. This ocean-going reptile ranges from India to the Fiji Islands and is a notorious man-killer. Many people also fall victim to the African Crocodile (*C. niloticus*), abundant in most of the larger lakes and rivers of that continent. In the Ganges the Mugger or Marsh Crocodile (*C. palustris*) plays a useful role as a scavenger of the corpses consigned to that sacred river. *C. americanus* is now rare in southern Florida though still common farther south.

CROCODYLIA, krök-ô-dīl'î-â, an order of the Reptilia (q.v.) consisting of the alligators, caimans, crocodiles, garials, and many fossil forms. Of the five suborders only one (Eusuchia) has any living representatives. Of amphibious habits, members of the order are characterized by their massive, lizard-like build,

having forelimbs somewhat shorter than the hind ones, and a long tail. However, the cloacal opening is longitudinal and the male copulatory organ single and anterior. Recent crocodilians, at least, are encased in a protective armor of horny shields overlying bony plates. Largest of all living reptiles, crocodilians are unique in possessing a practically four-chambered heart, the ventricle being almost completely divided; venous blood is supplied to the viscera while arterial blood nourishes the body walls, limbs, and head. The snout is more or less elongate, the usually sculptured skull tending to be broad and flattened posteriorly, with large, fixed quadrate and strong quadratojugal arch. The numerous teeth, designed for holding, are typically thecodont, the forward ones conical and pointed, the rear ones sometimes blunter. The presacral vertebrae are procoelus in advanced forms; abdominal ribs are compound; and both pubic bones are simple and connected by cartilage with the relatively short and broad ischium.

Though living crocodilians are confined to tropical or subtropical regions, in bygone eras their distribution was probably world-wide, numerous fossil forms having been found in northern Europe and as far north as Canada in the Americas.

The earliest known crocodilians (*Protosuchia*) occur in the Triassic, so the group is a very ancient one. Though they resemble the *Thecodontia* in many ways, these ancestral forms agree with more recent types in such diagnostic characters as structure of the otic region, type of coracoid, elongate carpals, partial elimination of the pubis from the acetabulum, and the like. Crocodilians essentially similar to modern types (*Mesosuchia*) first appeared in the early Jurassic and abounded during the Cretaceous. While their pterygoids fail to participate in the formation of a secondary palate, these reptiles agree with their successors in having the pubis completely excluded from the acetabulum. With the later Mesozoic arose the modern crocodilians (*Eusuchia*) whose principal characteristic is the entrance of the pterygoids into the formation of the secondary palate. They flourished during the Tertiary, and the 25 surviving species are but a remnant of the once numerous order. Of the two other suborders distinguished, the *Sebosuchia*, known from the Cretaceous, Eocene, and Miocene of South America, consists of a few species with crested skulls that are much higher and narrower than in other groups. The *Thalattosuchia*, occurring chiefly in the Jurassic, though a few are known from the Cretaceous, are marine forms with short pectoral paddles in place of forelimbs, and tails not unlike those of the ichthyosaurs.

For further details consult A. S. Romer, *The Osteology of Reptiles* (Chicago 1954).

CROCOITE, krō'kō-it, lead chromate (PbCrO_4), is a mineral crystallizing in the monoclinic system. It is found as slender prisms, in vertically striated columnar aggregates, and in granular form. Bright hyacinth red in color with orange-yellow streaks and of adamantine to vitreous luster, it has a hardness of 2.5 to 3 on the Mohs' scale and a specific gravity of 6.0. Its chemical composition is PbO (lead oxide) 89.9 per cent and CrO_3 (chromic oxide) 31.1 per cent. A rare mineral, not abundant enough to be of commercial value except as a pigment of

chrome yellow, it is historically interesting because in it Louis Nicolas Vauquelin (q.v.) first discovered the element chromium in 1797. The best specimens, prisms about 3 or 4 inches long and of brilliant color and luster, are found in Tasmania. Crocoite also occurs in Rumania, Siberia, the Ural Mountains, and in the vulture district of Arizona.

CROCUS, krō'kūs, in Greek mythology, a youth who was enamored of the nymph Smilax. He was changed by the gods into the flower which was named after him. According to another tradition, he was metamorphosed by his friend, the Olympic god Hermes, who had killed him by accident while playing a game of discus.

CROCUS, a genus of about 80 species of hardy bulbous plants belonging to the iris family (Iridaceae), with fleshy corms and basal, grass-like dark green leaves. Lacking a true stem, the goblet-shaped white, yellow, or lilac flowers, 3 to 5 inches long, appear either in spring or autumn and raise their expanded segments above ground by a long, slender perianth-tube. Native to Europe and southwestern Asia, they have been cultivated since antiquity. A number of species are grown today in the United States as garden flowers; the numerous horticultural forms of Dutch crocuses derived mostly from *C. aureus* and *C. vernus* are particularly famous. Corms of known species and forms should be planted several inches deep in good and well-drained soil, as new corms are formed on top of the old. Seeds are used when new varieties are desired.

Saffron, Spanish Saffron, True Saffron, etc. (*C. sativus*), an autumn-blooming species, contains a coloring agent (saffron) composed of picrocrocin (a bitter glucoside), crocin (a yellow powder), 1 per cent volatile oil, fixed oil, and wax, found chiefly in the three long, orange-colored, convoluted, and fragrant stigmas. Ancient and medieval physicians used saffron as a nerve sedative. Today it is used for coloring and flavoring.

CROES, John James Robertson, American civil engineer: b. Richmond, Va., Nov. 25, 1834; d. 1906. Graduated from the College of St. James, Maryland, in 1853, he began practice as a civil engineer three years later. From 1865 to 1870 he was resident engineer of the first high masonry dam in the United States at Boyd's Corners, New York. Later he became topographical engineer for the New York City Park Department (1872-1878) and chief engineer of the Suburban Rapid Transit Railroad in New York City (1885-1891). His expert reports on the problems of reservoirs, dams, sewerage, waterworks, and like matters, were sought by various cities. He was a contributor to numerous engineering journals, principally the *Sanitary Engineer*, from 1880 to 1890, and president of the American Society of Civil Engineers (1901).

CROESUS, krē'sūs, king of Lydia, last of the Mermnadæ line. He succeeded his father, Alyattes, in 560 B.C., extending his territory by conquest to include the region from the north and west coasts of Asia Minor to the Halys (Kizil Irmak) River. The vast wealth which he amassed from the mines of his dominion and in trade with his neighbors has become proverbial.

Sardis, his capital city, was a center of arts and letters. He contributed generously to the rebuilding of the Artemesium at Ephesus and made offerings to many Greek oracular shrines, especially that at Delphi.

His interpretation of the Delphic oracle's saying encouraged him to war with Cyrus, king of Persia. He was defeated and taken prisoner by the latter at Sardis in 546 B.C. Herodotus relates that Croesus, condemned to the funeral pyre by Cyrus, repeated the name of Solon three times. On being asked by Cyrus for an explanation, Croesus told how, at the height of his success and wealth, he had asked Solon, "Am I not the happiest of men?" and the philosopher had replied, "I pronounce no man fortunate until his death." Impressed by the story, Cyrus spared Croesus' life and later made him a trusted friend, and a power in his court, recommending him to the favor of his son Cambyses after his own death. Herodotus relates further that when Cambyses went mad, he ordered Croesus killed, but Croesus' life was saved by the king's servants.

Consult How, W. W. and Wells, Joseph, *A Commentary on Herodotus* (Oxford 1912); Jebb, Richard C., *Bacchylides* (London 1905).

CROFFUT, William Augustus, American author: b. Redding, Conn., Jan. 29, 1835; d. Washington, D.C., Aug. 31, 1915. He was educated in the public schools and received a Ph.D. from Union College. He entered the field of journalism in 1852, became a private in the U.S. Army during the Civil War, and, on his release, returned to journalism, working, at various times, as editor of the *Minneapolis Tribune*, the *New York American*, the *Rochester (N.Y.) Democrat*, the *American Architect*, and *Heath and Home*, among others. From 1888 to 1894 he was executive officer of the U.S. Geological Survey, and in 1899 he organized and became secretary of the Anti-Imperialist League as well as president of the Liberty League. He is the author of *A War History of Connecticut* (1867), *A Helping Hand for American Homes* (1868), *A Midsummer Lark* (1882), *Fifty Years in Camp and Field* (1909); several volumes of verse, including the opening ode for the Chicago Exposition of 1893; many pamphlets; and *Deseret*, an opera with music by Dudley Buck (1882).

CROFT, krôft, or CROFTS, William, English composer and organist: b. Nether-Ettington, Warwickshire, England, Dec. 30, 1678; d. Bath, Aug. 14, 1727. A student of Dr. John Blow at the Chapel Royal, he had, by 1700, collaborated in the publication of a collection of *Ayres for the Harpsichord or Spinnet* and had been appointed organist of St. Anne's Church in Soho. In 1707 he became organist of the Chapel Royal, and a year later succeeded his teacher, Dr. Blow, as official organist of Westminster Abbey. With this position he also assumed the duties of master of the children and composer to the Chapel Royal. He composed numerous odes, anthems, songs, and sonatas for flutes and violins; his most outstanding work, however, was the *Musica Sacra*, which was published in two volumes in 1724. Included in this choral group was the burial service, which still forms the classic setting of the Anglican Church ritual, sections of it being played on almost every ceremonial occasion. He was an original member of the Academy of Vocal Musicians at its founding in 1725.

CROFTER, krôft'er, a term applied throughout the highlands of Scotland to a type of small farmer who rents or cultivates a limited holding of land. The crofters, or cotters, are for the most part descendants of clan members who paid rent in lieu of personal services. They live chiefly in crofting townships or parishes and enjoy grazing and peat-cutting rights in joint tenancy with their neighbors.

Many crofters were displaced in the 19th century to make way for deer forests and sheep farms. Some emigrated to other countries while others resettled near the seashore where they could add to their meager income by fishing. Their grievances were investigated by a parliamentary commission in 1883 which secured the passage of the Crofters' Holding Act of 1886. Under this act their holdings were defined as from 3 to 10 acres of arable land and their rent was not to exceed £30 a year. In Argyle, Sutherland, Inverness, Caithness, Ross and Cromarty, Orkney, and Shetland counties, to which this legislation was limited, there were estimated to be 40,000 crofting families, and crofters are also found in other counties. See also SCOTLAND.

CROGHAN, krô'gân, George, American military officer: b. near Louisville, Ky., Nov. 15, 1791; d. New Orleans, La., Jan. 8, 1849. Entering military life after his graduation from William and Mary College in 1810, he distinguished himself at Fort Meigs and Fort Stephenson in 1813, winning the rank of lieutenant-colonel and a congressional medal for bravery. He resigned from the army in 1817 and served briefly as postmaster at New Orleans in 1824, but re-enlisted in the regular army a year later as an inspector-general. In 1846 he was a colonel with Gen. Zachary Taylor's forces in Mexico and took part in the Battle of Monterrey.

CROKER, krô'kër, John Wilson, British statesman and writer: b. Galway, Ireland, Dec. 20, 1780; d. Hampton, England, Aug. 10, 1857. After obtaining his B.A. degree from Trinity College, Dublin, he studied at Lincoln's Inn for two years and was admitted to the Irish bar in 1802. He entered Parliament in 1807 from Downpatrick, serving continuously until his resignation in protest against the Reform Bill of 1832. In 1807, also, he was appointed deputy chief secretary for Ireland, and three years later became secretary of the Admiralty, a post he held for 20 years under various governments.

His literary career began in 1804 with *Familiar Epistles on the Irish Stage*, a clever satire. In the same year, *Songs of Trafalgar* established him as a poet, while *A Sketch of the State of Ireland, Past and Present* (1808) proved him an able political pamphleteer. Much of his critical output found an outlet in the *Quarterly Review* with which he became associated at its inception in 1809. Here he published biting criticisms of Keats' *Endymion* (1818) and of Macaulay's *History of England*, the latter in retaliation for Macaulay's attack on his own best work, an edition of Boswell's *Life of Johnson* (1831). Disraeli satirized him as Rigby in *Coningsby*, but despite all criticism he continued his essays in the *Quarterly Review* until 1854 and was at work on an annotated edition of Pope at the time of his death. Other of his works are *The Battles of Talavera*, a poem (1809), *Stories for Children from the History of England*

(1817), and *Military Events of the French Revolution of 1830* (1831).

Consult the *Crocker Papers*, 3 vols., ed. by Louis L. Jennings (London 1884), and Brightfield, M. F., *John Wilson Crocker* (Los Angeles 1940).

CROKER, Richard, American politician: b. Clonakilty, Ireland, Nov. 23, 1841; d. Glencairn, April 29, 1922. His parents emigrated to the United States when he was a child and he was educated in the public schools of New York City. He joined Tammany Hall in 1865, becoming a member of the faction opposing "Boss" Tweed. In 1868, 1870, and 1883 he was elected an alderman of New York City, and held, in addition, the offices of coroner (1873-1879), fire commissioner (1883), and city chamberlain (1889-1890). Meanwhile he rose as a power in Tammany Hall until he became its acknowledged leader in 1886. His leadership was discredited in 1894, however, and he went to England, but returned in 1897 to elect Robert C. Van Wyck as first mayor of greater New York. With the election of a fusion candidate four years later, Crocker's power again waned and he retired to England and later, Ireland. He maintained racing stables at Glencairn, winning the Derby in 1907.

CROKER, Thomas Crofton, Irish antiquary: b. Cork, Ireland, Jan. 15, 1798; d. London, England, Aug. 8, 1854. While apprenticed as a youth to a Cork merchant, he found time to travel about southern Ireland, recording its songs and legends, some of which were favorably received by Thomas Moore and included in his *Irish Melodies* (1818). Crocker obtained a clerkship at the Admiralty in London in 1819, and held it until 1850, meanwhile continuing his literary activities. His first major work, *The Fairy Legends and Traditions of the South of Ireland* (1825), was well received as were his *Legends of the Lakes* (1829) and *Popular Songs of Ireland* (1839), all of which evidenced careful scholarship combined with a pleasing facility of expression.

Crocker was also active in the Society of Antiquaries and helped to found the Camden Society in 1839 for which he wrote *Narratives Illustrative of the Contests in Ireland in 1641 and 1690* (1841). In addition he was a founder of the Percy Society (1840), to which he dedicated *Historical Songs of Ireland* (1841), and of the British Archaeological Association (1843), and registrar of the Royal Literary Fund (1837-1854).

CROLL, kröl, James, Scottish geologist: b. near Coupar-Angus, Perthshire, Scotland, Jan. 2, 1821; d. Perth, Dec. 15, 1890. Despite a limited elementary school education, he advanced himself to a position of scientific prominence through independent study. In 1859 he was appointed keeper of the Anderson College museum in Glasgow, and from 1867 to 1881 was keeper of maps and correspondence for the Geological Survey of Scotland at Edinburgh. His most important contribution to geological climatology was *Climate and Time* (1875) for which he was elected to the Royal Society in 1876. He also produced such other works of scholarship as *The Philosophy of Theism* (1857), *Discussions on Climate and Cosmology* (1886), *Stellar Evolution* (1889), and *The Philosophic Basis of Evolution* (1890).

CROLY, krölī, David Goodman, American journalist: b. Clonakilty, County Cork, Ireland, Nov. 3, 1829; d. New York, N. Y., April 29, 1889. Taken to the United States as a child, he attended New York City schools and New York University (1854). He joined the staff of the *New York Evening Post* in 1855, but left it in 1857 to found the Rockford, Ill., *Daily News* with his wife, Jane Cunningham Croly (q.v.). With the failure of the *News* he returned to New York City, to become managing editor of the *World* (1862-1872) and founder and editor of the *Real Estate Record and Builders' Guide* (1868-1873) and the *Modern Thinker* (1873). In 1873 also he transferred to the *Daily Graphic*, where he remained until 1878.

Croly's *A Primer of Positivism* (1871) sought to popularize that philosophy in the United States. In other works, *Miscegenation* (1864), a collaboration; *Truth* (1872); and *Glimpses of the Future* (1888), he evinced an independent, iconoclastic spirit.

CROLY, George, Irish author and cleric: b. Dublin, Ireland, Aug. 17, 1780; d. London, England, Nov. 24, 1860. He was ordained in the Anglican Church ministry in 1804 after studying at Trinity College, Dublin. Dissatisfied with his curacy, he went to London in 1810 where he wrote for various journals and, in 1817, published his first book of poetry, *Paris in 1815*, in imitation of Byron's *Childe Harold*. Other poetic works were *The Angel of the World* (1820) and the tragedy *Catilina* (1822).

Croly was more successful with his historical novels, *Salathiel* (1829) and *Marston* (1846), which were sensational in style and imitative of de Quincey and Moore. He eventually obtained a pastorate at St. Stephen's, Walbrook, London, in 1835 and held briefly the chaplaincy of the Foundling Hospital in 1847.

CROLY, Jane (nee CUNNINGHAM; pseudonym JENNIE JUNE), American journalist: b. Market Harborough, Leicestershire, England, Dec. 19, 1829; d. New York, N. Y., Dec. 23, 1901. She arrived in the United States in 1841, and lived in Poughkeepsie, N. Y., where she was privately educated. She began her writing career with syndicated fashion articles and, following her marriage to David G. Croly (q.v.) in 1857, continued to pioneer as a woman journalist. From 1860 to 1887 she edited *Demorest's Illustrated Monthly* and at various times was associated with the *Home-Maker* and *Godrey's Lady's Book*. She was a New York correspondent for such newspapers as the *New Orleans Picayune* and the *Baltimore American*, and was also on the staff of the *New York World*, *Times*, and *Graphic Daily Times*.

Equally active as an organizer, she called the first woman's congress in 1856; founded Sorosis, the first important woman's club (1868); and organized the Women's Press Club (1889). She was the author of *The History of the Woman's Club Movement in America* (1898). Other, less notable works were *Jennie June's Cookery Book* (1866) and *For Better or Worse* (1875).

CRO-MAGNON MAN, krō-mā-nyôn', the name given to the portions of four prehistoric skeletons found in the Cro-magnon cave near Les Eyzies, Dordogne, France, in 1886. These skeletons are considered to be those of a type

of man who inhabited southwestern Europe in the late Paleolithic period. Considered the closest prototype of modern man, they appeared to be about six feet tall, with a capacious cranium, high forehead, narrow nose, and prominent chin. The remains of weapons, ornaments, and polychrome art found with them denote an advanced stage of culture. See also MAN, PREHISTORIC RACES OF.

CROMARTY. See ROSS AND CROMARTY.

CROMARTY FIRTH, an inlet of the sea on the east coast of Scotland, extending 18 miles inland from the Moray Firth in a southwesterly direction through the county of Ross and Cromarty. Protected at its entrance by the Sutors of Cromarty, two headlands over 400 feet high, it has a width of from 3 to 5 miles and a depth ranging from 5 to 40 fathoms. Because it is completely landlocked, it serves as an excellent shelter for shipping and was used as a base by the Royal Navy during World War I.

CROME, krôm, John, English landscape painter: b. Norwich, England, Dec. 22, 1768; d. there, April 22, 1821. The founder and chief painter of the Norwich school of painting in Britain, he served an apprenticeship of seven years with a coach, house, and sign painter, but, except for what he learned in this trade, was largely self-taught. A Norwich collector of paintings allowed Crome to study the Gainsboroughs in his gallery, and the young painter was also strongly influenced by the works of Richard Wilson. In 1803 he helped to found the Norwich Society of Artists, and sent landscapes to the first exhibition of the society in 1805. The following year he also contributed to the Royal Academy Exhibition in London.

In 1814 Crome visited Paris for the first time and on his way back to England, traveled through Belgium. Two pictures, the *Boulevard des Italiens* and the *Fishmarket at Boulogne*, which are in the gallery at Norwich, directly reflect this voyage. Of about this same time are his two best-known works, *Mousehold Heath* and *Porringland Oak*, both of which are now in the National Gallery in London.

Crome had a great admiration for Joseph Mallord William Turner, who seems in return to have borrowed, in at least one picture, from Crome. As a mature artist, Crome also studied with the greatest respect the paintings of the 17th century Dutch landscapist Meindert Hobbema, and, though he seems to have imitated the latter in choosing motives, he always kept his personal naturalistic approach. He was also a pioneer in the field of engraving. Many paintings are wrongly ascribed to Crome because he had a great number of pupils, close followers, and imitators. To distinguish him from his son, John Berney Crome (1794-1842), who was also a painter, the elder Crome is called "Old Crome."

Bibliography.—Dickes, William F., "John Crome," *The Norwich School of Painting*, chaps. 1-3 (London 1905); Holme, Geoffrey, ed., "John Crome," *The Norwich School*, pp. 8-16 (London 1920); Baker, Charles H. C., *Crome* (London 1921); Smith, Solomon C. K., *Crome, with a Note on the Norwich School* (London 1923); Nottram, Ralph H., *John Crome of Norwich* (London 1931); Redgrave, Richard, and Redgrave, Samuel, "John Crome," *Century of British Painters*, pp. 347-357 (Oxford 1947).

CROMER, Evelyn Baring. See BARING, EVELYN.

CROMLECH, krôm'lêk, the name given to a kind of megalithic sepulchral monument of prehistoric times. Consisting of three or more columns of unhewn stone supporting a large tabular block which form a rectangular chamber, it usually contains a chamber or cist beneath its floor enclosing a skeleton with arms, stone implements, or other relics. Sometimes the cromlech was encircled by a ring of standing stones, and sometimes it was itself buried beneath a large mound of earth.

Cromlechs are found throughout Great Britain and in Europe, Asia, and America. Among the most remarkable cromlechs in England are Kit's Coty House, near Aylesford, Kent; Chun Quoit, Cornwall; and Plas Newydd, Anglesey. Those in Scotland include the Auld Wives' Lifts, near Craigmaddie House, Stirlingshire, and the Witch's Stone at Bonnington Mains, near Edinburgh. See also DOLMEN.

CROMMELIN, krôm-mê-lân', Andrew Claude de la Cerois, shâ-rwâ', English astronomer: b. Cusshendun, County Antrim, Ireland, Feb. 6, 1865; d. London, England, Sept. 20, 1939. Educated at Trinity College, Cambridge (1886), he became assistant master at Lancing College in 1889 and later joined the Royal Observatory at Greenwich (1891-1927), where he specialized in the study of the orbits of comets and minor planets. A council member, and later president (1904-1906), of the British Astronomical Association, he took part in its eclipse expeditions in 1896, 1900, and 1905, and participated in the solar expedition to Brazil in 1919. With P. H. Cowell, he published a study of the motion of Halley's comet from 240 B.C. to 1910 A.D. He wrote numerous scientific articles and was co-author, with Mary Proctor, of *Comets* (1937). He was president of the Royal Astronomical Society, 1929-1930.

CROMMELYNCK, krôm-û-lêk', Fernand, Belgian dramatist: b. Brussels, Belgium, 1888. A member of a family closely connected with the theater, he gained an early and complete theatrical training and began both to act and to write for the stage. From the beginning he showed unusual skill in creating morbid atmospheres. *Nous n'irons plus au bois* (1906), the first play of this early period, met with little critical acclaim, and its successors, *Le Sculpteur de masques* (1908) and *Le Marchand de regrets* (1913), were also coolly received. It was not until *Le Cocu magnifique*, a lyrical farce, was produced in Paris at Lugné-Poë's Théâtre l'Oeuvre in 1920, that he gained international fame.

Moving to Saint-Cloud, near Paris, he devoted his time entirely to writing. His next play, *Les Amants puerils* (1923), was less successful, but *Tripes d'or* (1930) renewed his prestige and was produced in Russia by Vsevolod Meyerhold. *Carine, ou la Jeune Fille folle de son âme* (1934) again showed him to be an expert dramatist of strong lyric power; *Une Femme qui a le coeur trop petit* (1934) had even wider appeal. But his increasing concentration on dramatic technique lessened the force of his writing, and *Chaud et froid* (1936) fell below his earlier achievements.

CROMPTON, krûmp'tûn, Henry, English philosopher: b. Liverpool, England, Aug. 27,

1836; d. Surrey, March 15, 1904. After graduating from Trinity College, Cambridge, in 1858, he became a clerk of the court of assize on the Chester and North Wales circuit, and held this post for 43 years. His interest was aroused in the positivist philosophy of August Comte and he began to take an active part in the positivist movement in England. In addition he absorbed himself in social questions of the day, notably the trade-union movement. From these interests came his best-known works, *Letters on Social and Political Subjects* (1870), *Industrial Conciliation* (1876), and *Our Criminal Justice* (1905).

CROMPTON, Samuel, English inventor: b. Firwood, near Bolton, England, Dec. 3, 1753; b. Bolton, June 26, 1827. Forced to work at home as a child on the crude spinning jenny of the time, he resolved to improve the machine, and in 1779 perfected the much-improved spinning mule. It combined the best features of Hargreave's spinning jenny and Arkwright's roller-frame with a spindle carriage which made possible the production of a very fine yarn. Although his machine laid the basis for muslin manufacture in Britain, he was financially unable to patent it, and was forced to release it to the public on the promise of a subscription from its users. The promise barely materialized and, disheartened, Crompton resumed spinning on his own machine. Private subscription later brought him a limited sum, and the House of Commons granted him £5,000 in 1812 which he invested in private enterprise, first as a bleacher and later as a cotton merchant.

CROMWELL, kröm'wēl, Bartlett Jefferson, American naval officer: b. near Springplace, Ga., Feb. 9, 1840; d. June 24, 1917. Graduated from the U.S. Naval Academy in 1861, when the Civil War was already in progress, he was first assigned to the *Iroquois*, and then joined the South Atlantic Blockading Squadron in 1862. He participated in naval attacks on Morris Island, off Charleston, S. C., commanded the captured Confederate ram, *Atlanta*, on its journey to Philadelphia in 1863, and was transferred to the East Gulf Squadron the same year. He was commissioned a commander in 1874, and served as inspector of ordnance at navy yards in Philadelphia (1874-1878), Portsmouth (1882-1884), and League Island (1886-1889). Following his promotion to commodore in 1898, he was sent to Havana, Cuba, to receive the surrender of its naval station at the conclusion of the Spanish-American War, and remained as its commander. In 1901, with the rank of rear admiral, he commanded in South American and European waters.

CROMWELL, Henry, English administrator: b. Huntingdon, England, Jan. 20, 1628; d. Soham, Cambridgeshire, March 23, 1674. The fourth son of Oliver Cromwell, he served as a colonel under his father in Ireland in 1650, was nominated to Parliament from Ireland in 1653, and returned there in 1654 as commander of the Irish Army with the rank of major-general and member of the ruling council. In 1657 he became lord deputy and, a year later, lord lieutenant and governor general. Although he was popular with the people because of his consideration and justice, he was recalled by Parliament in 1659, and he subsequently retired to Spinney Abbey in Cambridgeshire.

CROMWELL, Oliver, lord protector of England: b. Huntingdon, England, April 25, 1599; d. London, England, Sept. 3, 1658. He was the second son of Robert Cromwell and Elizabeth Steward. His father was the second son of Sir Henry Cromwell and grandson of Sir Richard Williams who had taken the surname of Thomas Cromwell, his uncle and patron.

Oliver was educated at a free school in Huntingdon. In 1616 he entered Sidney Sussex College, Cambridge, described by Bishop Laud as a nursery of Puritanism, but left it a year later on his father's death. After his marriage to Elizabeth Bourchier in 1620, he settled on his father's estate in Huntingdon, and in 1628 was elected to Parliament. He was also made a justice of the peace in 1630. Strongly inclined toward Puritanism at this time, he had a religious experience previous to 1638 which he afterward described as "being given to see the light."

When the endeavor of Charles I to rule without Parliament came to an end in 1640, Cromwell was elected as member for Cambridge. The Puritans in this Parliament outnumbered the supporters of the Established Church and the bishops, and some of the Puritans sought to replace the Episcopal Church with Presbyterianism. During the next two years Cromwell, as a leader of the Puritans, was active in condemning episcopacy and in supporting measures for the defense of "England and Ireland"—which by 1642 had come to mean the organizing of a parliamentary army against the king.

In 1642 he armed the county of Cambridge and secured it for Parliament. He then joined the army of the earl of Essex (Robert Devereux) and took part in the first important battle of the Civil War at Edgehill (Oct. 23, 1642). The following winter he built up a regiment of what he called "honest, sober Christians," and in the ensuing twenty months he was successful in a number of actions in eastern England, distinguishing himself at Marston Moor (July 2, 1644) against Prince Rupert, who is said to have first called him "ironside." He became, successively, colonel, governor of the island of Ely, acting second in command to Lord Manchester (Edward Montagu), lieutenant-general, and a member of the parliamentary Committee of Both Kingdoms.

His advocacy of toleration of the independents among the Puritans set Cromwell at odds with the Presbyterians in the army. This difference and Manchester's inactivity and hesitation, particularly in the Second Battle of Newbury (Oct. 27, 1644), resulted in debate in the Commons. Having aroused the animosity of the Presbyterians, the Scots, and the House of Lords, however, Cromwell dropped his personal quarrel with Manchester so that he might secure the passage of the Self-denying Ordinance by which members of both houses were debarred from military command.

The application of this ordinance to Cromwell himself was deferred by Parliament. He meanwhile campaigned under Sir William Waller in the West Country, under Thomas Fairfax in Oxfordshire, and on his own in the eastern counties. Rejoining Fairfax, he took part in the battles of Naseby (June 14, 1645) and Langport (July 10), and in a series of sieges in the southwest. In the spring of 1645, Fairfax sent him to report to Parliament, which rewarded him with an estate of £2,500.

Cromwell returned to the army to negotiate the surrender of Oxford (June 15, 1646), which brought the fighting to an end. The leniency of the surrender terms he proposed was subsequently criticized by both Presbyterians and extremists when Cromwell pressed for their implementation as necessary to maintain the good name of the army. He had meanwhile returned to London with his family, and he opposed vigorously in person those in Parliament who were legislating England into a Presbyterian conformity. His opponents were seemingly about to arrest him when, on June 3, 1647, he left London to rejoin the army.

The army's council of war, of which Cromwell immediately became the leader, opened negotiations with the king, and on Aug. 1, 1647, its compromise proposals for a settlement were made public. At the same time Cromwell entered London with the army and expelled eleven members of the House of Commons. Parliament then put forth its own proposals which the king refused, while still not accepting those of the army.

Cromwell persuaded Parliament to prepare fresh terms limiting the duration of the proposed Presbyterian settlement, but before these were presented, the king fled (November 11) to the Isle of Wight. It was probably this act, and the king's covert negotiations with the Scots, which decided Cromwell to reverse his policy. His endeavors to conclude an agreement with Charles at the cost of some compromise had threatened to destroy his influence with the army, and during November he and Fairfax were forced to restore discipline. He promised the troops redress of their grievances and reform of Parliament; and in January 1648 he persuaded Parliament to embark on government without the king. The two sides were again at war.

Fairfax sent Cromwell (May 1, 1648) to subdue an insurrection in Wales. As soon as this task was completed, Cromwell joined John Lambert and, at Preston, caught and defeated the Scots army under the duke of Hamilton (James Hamilton) while they were marching unguardedly to the south (Aug. 17-19, 1648).

Parliament had meanwhile repealed the vote of No Addresses to the King and negotiated the Treaty of Newport with Charles. Before Cromwell's forces could return from the north, the southern army had taken action against Parliament, and when Cromwell reached London in December, Pride's purge of 140 of the 200 members had already begun. The remainder of the Commons then moved to the trial of the king, while the council of war framed the new constitutional proposals known as the Agreement of the People. Cromwell's part in these two developments is not recorded in detail, but he seems to have regarded both as "things which God put into our hearts." When the trial of the king began, he was active in pressing it to the king's condemnation. Charles was executed on Jan. 30, 1649, and Cromwell expected that "Christians in aftertimes" would speak of it "with honour."

Cromwell's dominant position was now attacked by the extremist Levellers, and a section of the army mutinied. He and Fairfax swiftly restored order (May 1649) before he left for Ireland where the council of war sent him as lord lieutenant and commander in chief. His nine months in Ireland (August 1649 to May 1650) were intended to establish freedom of conscience and justice, as well as to promote English coloni-

zation, but his tolerance, however real for variants of Protestantism, was only nominal for Roman Catholics. The slaughter of the defenders of Drogheda and Wexford left a lasting bitterness, despite Cromwell's belief that this was "a righteous judgment of God upon these barbarous wretches."

In January 1650 Parliament had decided on Cromwell's recall, and in June it appointed him to serve under Fairfax. On Fairfax's resignation, Cromwell was named (June 26, 1650) captain general and commander in chief for the war against Scotland where Prince Charles (afterward Charles II) had been proclaimed king. Cromwell's victory against odds at Dunbar (Sept. 3, 1650) and his protestations of friendship for the Scots enabled him to secure southern Scotland by the year's end. He fell sick in the new year, however, and when he again faced the Scots they were in a prepared position near Stirling. Moving to their rear, he captured Perth on Aug. 2, 1651. Charles, meanwhile, took the opportunity to advance into England, and it was not until he reached Worcester that Cromwell was able, with the aid of the local militia, to halt and surround the Royalists and inflict the decisive defeat (Sept. 3, 1651). For his services Parliament granted him lands worth £4,000 a year and an estate at Hampton Court.

The struggles over toleration and constitutional reform were now resumed between Cromwell and Parliament until an apparent act of bad faith over an electoral bill provoked Cromwell to dissolve the Long Parliament by force (April 20, 1653). He was now the only central authority in the land. As such he, with his council, convoked a new and nominated parliament. This body produced such confusion, however, that some of its members voluntarily, and the others under threat from Cromwell's soldiers, resigned their powers again to Cromwell (Dec. 12, 1653). The council of officers then installed him (December 16) as lord protector under a newly drawn constitution which separated executive and legislative powers. He did not call another parliament for ten months, and his ordinances of this period, when he was virtual dictator, form the main part of his constructive achievement. He effected the legal union of the three kingdoms of England, Ireland, and Scotland, reorganized the church, improved the administration of justice, promoted trade, and strove to enforce a reformation of manners.

The same ten months saw the major achievements of Cromwell's foreign policy. The wars against Holland and Portugal had necessitated heavy taxation and interfered with trade. Cromwell's ideal was to build a great Protestant alliance. It was never realized, but in pursuing this aim, he successfully promoted the economic and commercial interests of Britain. He made peace with the States General (April 5, 1654), and concluded a commercial treaty with Sweden, a treaty with Denmark (Sept. 14, 1654), and a treaty with Portugal securing extraordinary liberties to English merchants.

In 1654 Cromwell convoked Parliament, but its efforts to secure a constitution giving it political and military supremacy with the power of virtual self-perpetuation, and its intolerance, caused Cromwell to dissolve it on Jan. 22, 1655. Plots against him were forestalled or suppressed in February and March and a new dictatorial rule through twelve regional commanders, called

major generals, was introduced. This provoked protests which in turn resulted in some repression.

At the same time, Anglo-Spanish hostilities in the Americas grew and spread to Europe. Cromwell prepared against the foreign threat by making commercial treaties with France (Oct. 24, 1655) and Sweden (June 1656), the latter cutting off the supply of naval stores to Spain. The threat of war and the need for additional taxes to pursue it led to the calling of another parliament in September 1656.

By now the inability to find any middle road between a dictatorial and a parliamentary tyranny was forcing both parties back toward the idea of a constitutional monarchy as a solution. On March 25, 1657, Parliament proposed, by 123 votes to 62, to invite Cromwell to accept the crown. He and the army disliked the title of king, but in accepting, with hesitation, the substance of this settlement, he secured also the confirmation of his decrees of 1654, considerable civil and religious liberties, an increase in his constitutional powers, and the right to appoint a second chamber. A fixed revenue was set aside for the armed services and Cromwell was re-installed as lord protector on June 26, 1657. In January 1658 the Commons again sought to subordinate the protector to itself and in consequence he once more dissolved Parliament on February 4.

He had meanwhile concluded a military alliance with France (March 23, 1657). Admiral Robert Blake had destroyed the Spanish Fleet at Santa Cruz (April 20), and a British agent had mediated peace between Denmark and Sweden (February 1658). With the Anglo-French victory over Spain before Dunkerque on June 4, making Dunkerque and Mardyke English possessions, Cromwell's foreign achievements reached their zenith. Although Sweden and Denmark were soon at war again and France prepared to make peace with Spain, causing the prospect of a Protestant alliance to fade, the respect for British sea power remained and British commerce expanded.

During the summer of 1658 Cromwell's health was poor. His attendance on his daughter, Elizabeth Claypole, in her last illness, increased the strain, and he fell sick and died in Whitehall on September 3. He was buried in Westminster Abbey, but after the Restoration his body was exhumed and hanged at Tyburn.

Cromwell's Puritan convictions, moral strictness, and military leadership raised him to power. He saw in his victories the approval of God. Although his rule through the major generals was despotic, and although he was responsible for the Irish's massacres and shared responsibility for the execution of the king, he nevertheless showed more magnanimity than other military dictators or than most of the Puritan Party, and his later policies, particularly overseas, were constructive. Yet after he had overturned the throne and dissolved several parliaments by force, his death found the country on the road back toward the harmony of throne and parliament in a constitutional monarchy.

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R. S. MILWARD.

CROMWELL, Richard, lord protector of England: b. Huntingdon, England, Oct. 4, 1626; d. Cheshunt, Hertfordshire, July 12, 1712. The third son of Oliver Cromwell, he became his father's heir on the death of his elder brothers, Robert and Oliver. He served in the army and later was admitted to Lincoln's Inn (1647), but took no interest in government until 1654 when he stood for Parliament from Hampshire. He was elected again in 1656 from Cambridge. His father appointed him to a trade and navigation committee in 1655, but made no serious effort to bring him to the forefront until 1657 when he made him chancellor of Oxford (July) and member of the council of state (December). After his father's death on Sept. 3, 1658, he was named protector.

Unacceptable to the army and mistrusted by some of the council, he sought to appease the two, but succeeded only in increasing the dissension because of his lack of leadership. Parliament and the army finally united in agreement on his dismissal, which he accepted without protest on May 25, 1659. Fleecing his debtors, he went to France in 1660 where he assumed the name of John Clarke. He returned to England in 1680 and lived in retirement until his death.

CROMWELL, Thomas, EARL OF ESSEX, ɛs'ɛks, English statesman: b. England, ?1485; d. London, July 28, 1540. Of humble parentage, he ran afoul of the law as a young man, and in 1504 fled to Italy where he served in the French Army. He escaped from service to Florence and was befriended by Francis Frescobaldi, a banker. Going next to Flanders, he worked as a merchant's clerk in Antwerp and as a trader in Middelburg. On his return to England in 1513, he established himself as a wool merchant and moneylender, and in the latter capacity came to the attention of Cardinal Wolsey who, in 1514, made him collector of revenues for York. Cromwell's increased prominence enabled him to win election to Parliament in 1523 and admittance to Gray's Inn in 1524. Wolsey employed him as his agent in the dissolution of the small monasteries during 1525, and retained him as his secretary for the colleges at Ipswich and Oxford which were founded on the proceedings from the monasteries.

On Wolsey's downfall, Cromwell, who had already found favor with the new government of Norfolk to the extent of being returned to Parliament from Taunton in 1529, succeeded in defeating the bill of attainder against Wolsey. He also managed to be appointed to the Privy Council in 1531, and within two years became its outstanding member, being made master of the jewels and of wards in 1532, chancellor of the exchequer in 1533, and the king's secretary and master of the rolls in 1534.

He was largely responsible for the drafting of the Reformation acts between 1532 and 1539, and after his appointment as Henry VIII's vicar-general in 1535, carried into effect the Act of Supremacy and led in the suppression of the monasteries and the promulgation of the Protestant faith in England. Henry rewarded him with knighthood and made him lord privy seal and Baron Cromwell.

He was instrumental in the conviction of Anne Boleyn, negotiated a new marriage for Henry with Anne of Cleves (1539) to strengthen the Protestant union abroad, and was rewarded by being made Earl of Essex in April 1540. Henry was displeased with his marriage, however, and within two months, Cromwell was accused of treason by Norfolk before the council and sent to the Tower. He was refused a trial, and despite his aid in condemning Anne of Cleves, was convicted by a bill of attainder in Parliament and beheaded, protesting his belief in the Catholic faith.

Cromwell was a prime mover in the advancement of the Protestant Reformation in England, and the Church of England as a state-controlled institution continued to exist much as he left it. One of his significant innovations was the enactment that parish registers should be regularly kept of marriages, births, and deaths.

CRONIN, krō'nin, **Archibald Joseph**, Scottish physician and author: b. Cardross, Dumbartonshire, Scotland, July 19, 1896. He interrupted his medical studies at the University of Glasgow in 1916 to serve as a surgeon sub-lieutenant in the Royal Navy Volunteer Reserves, but returned to obtain his M.B. degree in 1919. After holding several medical positions in Glasgow, he practiced in South Wales from 1921 to 1924 when he was appointed medical inspector of mines. In 1926 he opened a private practice in London which he abandoned in 1930 because of ill-health. While recuperating, he began to write, producing a highly successful first novel, *Hatter's Castle* (1931). The two books which followed, *Three Loves* (1932) and *Grand Canary* (1933), were less well received, but the fourth, *The Stars Look Down* (1935), was widely praised. The *Citadel* (1937) was popular with the reading public but received mixed notices from the critics, as did a play, *Jupiter Laughs*, produced in London and New York City in 1940. In 1942 he scored a resounding success with *The Keys of the Kingdom*. He has since written *The Green Years* (1944), *Shannon's Way* (1948), *The Spanish Gardener* (1950), *Adventures in Two Worlds* (1952), an autobiography, and *Beyond This Place* (1953).

CRONJE, krōn-yā' **Piet Arnoldus**, South African military leader: b. within the area of the present Transvaal, Union of South Africa, about 1840; d. Klerksdorp, Transvaal, Feb. 4, 1911. His parents having migrated northward in the Great Boer Trek, he was raised under pioneering conditions and was a farmer for much of his life. He served in the Anglo-Boer War of 1880-1881, and was commander at the siege of Potchefstroom in 1881, where he forced the British garrison to surrender although an armistice had been signed some days before. Thereafter he held a number of government posts in the South African Republic (Transvaal).

On Jan. 2, 1896, at Doornkop, he captured the

Jameson raiders who had invaded the Transvaal. Later he was assigned, with the rank of general, to command in the western theater of the South African War. While besieging a British force at Kimberley, he faced a relieving division under Lord Methuen at Belmont, Graspan, and Modder River, and decisively defeated it at Magersfontein on Dec. 11, 1899. Early in the following year, another British division under Lord Roberts surrounded Cronjé and his men at Paardeberg where, after hard fighting, he surrendered on Feb. 27, 1900. He was held prisoner at Saint Helena until the conclusion of hostilities. After his release, he lived for a time in the United States and later returned to South Africa.

CRONSTADT. See KRONSTADT, USSR.

CRONSTEDT, krōōn'stēt, **BARON Axel Fredric**, Swedish mineralogist and chemist: b. Stropsta, Södermanland, Sweden, Dec. 23, 1722; d. Stockholm, Aug. 19, 1765. A councilor of mines and a member of the Academy of Sciences at Stockholm, he discovered nickel in 1751 by isolating the metal in impure form from niccolite. He introduced the use of the blowpipe in the study of minerals and was one of the first to recognize the importance of the chemical composition of minerals, using it as the basis of classification in his *Essay on Mineralogy* (1758). The mineral cronstedtite was named for him.

CRONUS, krō'nus, in Greek mythology the son of Uranus (Heaven) and Gaea (Earth), and the youngest of the Titans. At the instigation of his mother, he unmanned his father, and made himself ruler of the universe. He was the father, by Rhea, of Hestia, Demeter, Hera, Hades, Poseidon, and Zeus, who ultimately deposed him. The Romans identified him with their god Saturnus. See SATURN.

CROOK, krōōk, **George**, United States army officer: b. near Dayton, Ohio, Sept. 23, 1829; d. Chicago, Ill., March 21, 1890. After graduating from the U.S. Military Academy in 1852, he was assigned to the Pacific Northwest where he protected the settlers against Indian raids. He distinguished himself throughout the Civil War at South Mountain, Antietam, Chickamauga, and at the final battle at Appomattox. Subsequently he was reassigned to the Northwest (1866-1872), where he took part in the Sioux War of 1866, and fought against the Apaches led by Geronimo. In 1888, he was assigned to the command of the Division of the Missouri at Chicago, Ill.

CROOKED ISLAND, one of the Bahama Islands in the Atlantic Ocean, lying southeast of Florida and north of Cuba in latitude 22° 15' N., longitude 74° 13' W. A low-lying island of about 176 square miles, it has a subtropical oceanic climate with a mean annual temperature of 77° and an average rainfall of 45 inches. The chief product is salt. Pop. (1951) 1,179.

CROOKES, Sir **William**, English physicist: b. London, England, June 17, 1832; d. there, April 4, 1919. In 1854 he became superintendent of the meteorological section of the Radcliffe Observatory, Oxford, and in 1855 professor of chemistry at the Chester Training College. In 1859 he founded the *Chemical News* and after 1864,

edited the *Quarterly Journal of Science*. His own published writing in 1851 was concerned with the new compounds of the element selenium, the selenocyanides. His discovery of the element thallium was announced in 1861, and its atomic weight, in 1873. He also studied the properties of highly rarefied gases and investigated the elements of the "rare earths." In 1865 he discovered the sodium amalgamation process for separating gold and silver from their ores. He also produced diamonds artificially. He was the inventor of the radiometer (q.v.), in which a system of vanes, blackened on one side and polished on the other, begins to rotate when exposed to radiant energy. His apparatus known as Crookes Tube (q.v.) was used by Wilhelm Konrad Roentgen in the discovery of the X-ray. The experimental work which Crookes did on radiant matter changed the conception of it in both chemistry and physics. In 1900 he achieved the separation from uranium of its active transformation product, uranium-X. He published articles on spectroscopy and performed research on a great variety of other subjects.

During his lifetime Crookes received many honors and awards. In 1881 he was given the medal of the Universal Exposition in Paris. He was knighted by the British Empire in 1897 and received the Order of Merit in 1910. The Albert Gold Medal was awarded him in 1899 and the gold medal of the Society of Chemical Industry in 1912. At various times between 1908 and 1912 he was president of the Chemical Society, the British Association, and the Institute of Electrical Engineers, and was a member of many scientific institutions throughout the world. Included among his published writings are *Select Methods in Chemical Analysis* (1871) and *Diamonds* (1909).

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CROOKES TUBE, a tube invented by Sir William Crookes (q.v.) and used about 1875 for his research on electrical discharges in gases. In the vacuum tubes which he used the pressure was reduced to the point that the bright glow observed at high pressures almost disappeared. Obstructed by very little residual gas, the cathode rays shot straight across the tube and, striking upon the opposite glass wall, caused it to glow with greenish fluorescence. By placing an obstacle like a metal plate in the path of the rays, Crookes was able to show their rectilinear character by the shadow on the fluorescing surface. In another tube he interposed a light paddle wheel with metallic vanes in the ray's path and found the wheel driven with considerable speed. Thus he demonstrated that cathode rays produced fluorescence, traveled in straight lines, were deflected by a magnetic field, carried momentum, and transmitted energy.

CROOKSTON, krōōk'stūn, city, Minnesota, seat of Polk County, at an altitude of 863 feet, on the Red Lake River, and served by the Great Northern and Northern Pacific railways. Crookston is 300 miles northwest of St. Paul and Minneapolis on federal highways, in a fertile agricultural region. It ships wheat, livestock, dairy products, sugar beets, and potatoes. Power for the city is furnished by a lignite-burning steam plant. The city manufactures lumber, farm machinery, sashes and doors, and processes dehy-

drated alfalfa, certified seed potatoes, sugar beets, beans and peas. The Red River Valley winter show of livestock and farm products is held at Crookston annually. It has the Northwest School of Agriculture, a branch of the University of Minnesota; the Northwest Agricultural Experiment Station; and St. Joseph's Academy. First settled in 1870 by Col. William Crookes, it became a borough in 1878, and a city in 1882. It is governed by a mayor and a council of nine members. Pop. (1950) 7,352.

CROP. See AGRICULTURE IN THE UNITED STATES.

CROP INSURANCE. In general terms, crop insurance indemnifies against loss or damage from a variety of causes beyond the control of the insured; these causes may be divided broadly into weather hazards and pestilence hazards. In practice, the insurance has been written at one time or another in various ways: against all risks or against specified perils; by private insurers or by government agencies; and covering many kinds of crops, or restricted to one or to a few.

In the early years of underwriting this class of insurance, much experience was acquired by trial and error. In 1899, for example, a company issued a policy under which it agreed to purchase the entire crop insured at \$5 per acre at the option of the insured to be exercised not later than five days after threshing. The contract provided insurance against the hazards of weather and pestilence as well as that of price decline. As the valued amount proved to be at variance with the farmer's normal value output, and the premium charge, 5 per cent, inadequate, the insurer withdrew at the end of the season with a heavy loss. Another venture was undertaken in 1917 by two companies, each offering a broad coverage, for losses up to \$7 per acre at a 10 per cent premium; again both suffered loss and withdrew from this field. Three years later an insurer issued a policy on a cost-of-production basis. The insured was asked to list expenses per acre for such items as plowing, harrowing, rolling, seed, seeding, harvesting and threshing, including estimated rental value. A conservative percentage of this total was taken as the amount of insurance for which a 6 per cent premium was charged. All of the major hazards except hail were covered, and in addition, if for any reason the crop was physically damaged, the policy covered the hazard of a market decline. The drop in prices in the fall of 1920 made the results disastrous for the company. The following year the same company adopted a different basis; namely, the indemnity was measured from either a stated value per acre or a stated number of bushels per acre, the company reserving the right to choose the method. Only a small amount of insurance was placed and again it proved expensive. After 1921 no further attempts with broad coverage on basic crops were made by private insurers, though a few policies covering frost were placed at various times on citrus fruit and some with broader coverage on truck gardening, neither of which proved profitable.

Private Hail Insurance.—In coverage against the single peril of hail, private insurers have been writing insurance for a number of years. The business is written by both stock and mutual carriers. Originally confined to the grain-producing states between the Mississippi and the

Rockies, this type of crop insurance was written in the United States first in 1883. By 1914 approximately 16 stock fire insurance companies were in the field, and between that date and 1945 some 150 such companies wrote hail insurance from time to time; in the latter year the number was about 90. Their experience was checkered, with a loss ratio as high as 122 per cent in 1915; even in 1944, when the total net premiums amounted to over \$29,900,000, the ratio was 67 per cent caused by an unusual frequency of severe hailstorms in almost all states.

Attempts to improve loss ratios have been made, along with other ways, through employing practical agriculturists to gather information and statistics in order to establish adequate rates and improve policy forms; moreover, by 1936 several of the larger companies had extended operations to those states where cotton and tobacco are the primary crops, and a considerable volume was written also on tree fruits and truck crops, thus giving them a better spread and a more balanced income. A strong factor in the development of hail insurance has been provided by the Western Hail and Adjustment Association, a voluntary cooperative organization formed in 1915 by the hail-writing companies for compiling statistics under 64 crop classifications and as a clearing house for ideas, advisory rates, rules and forms.

As currently written (1946) hail insurance covers only the peril of hail damage to growing crops, commercially grown, except that wind damage accompanied by hail is covered on tobacco only. The list of crops that may be insured is a broad one, including—in addition to tobacco—cotton, bush and tree fruits (not the trees), vine fruits and vegetables, flax and the various grains.

Rates are established from the experience statistics of the companies, and vary in different localities and according to the susceptibility of the crop. Adjusted each year, they range from 3 or 4 per cent to as high as 15 or 20 per cent. Within stated limits per acre the farmer may insure his crop up to its full value.

As the hail insurance is seasonable and does not carry over from year to year, the private insurer sets up no reserve. Some companies, however, fix their own liability for each township, and when the maximum is reached, no further commitment is accepted for that township. Coverage may be placed by the farmer at any time from planting or sowing to harvesting, but the rate for the season is the same, regardless of the date of the application; he may increase the amount of insurance as the season advances.

In addition to the annual form of policy, a five-season form with guaranteed price per bushel is available. Its terms are essentially the same as those of the annual form, and it is written on a per bushel per acre basis instead of only an acre basis. There are also other variations.

State Hail Insurance.—A number of states at various times have provided hail insurance on specified crops. Those now doing so (1946) are North Dakota, where the State Hail Insurance Department began to function in 1919, some protection having been written under other departments as early as 1911; Montana, which has been offering this coverage through the State Board of Hail Insurance since 1917; and Colorado, through the State Hail Insurance Department since 1929. The grains, predominantly wheat followed by barley and oats, are the chief crops

insured in these states; coverage is provided in North Dakota also for flax, cane, and certain forage plants, while Montana includes also beans, peas, sugar beets, potatoes, mustard and alfalfa seed, and Colorado beans, beets, alfalfa and feed crops, and mixed vegetables. The limits of coverage vary: in North Dakota a farmer has the option of applying for \$5 or \$8 per acre; in Montana he may insure up to amounts ranging from \$8 to \$20 according to crop; and in Colorado up to the average value per acre of the crop with maxima fixed from \$7 to \$25 and an overall limit of \$2,500 for any person in one section. Rates depend on locality and on loss experience.

Though differing in detail, the basic plan in these states is to levy a tax on the lands insured sufficient to pay the indemnities and operating expenses, variations being that for certain special policies, North Dakota receives cash premiums, and Montana in 1946 allowed a 4 per cent discount for cash. In 1945 North Dakota paid approximately 25 per cent of the loss in the form of tax reduction and Colorado approximately 29 per cent; in the latter case the percentage was calculated on the basis of 80 per cent of the gross adjusted loss, that being the amount paid the insureds, for the law permits the board to prorate the indemnities in any year when the total losses exceed the estimated receipts available for payment of losses, plus the reserve. North Dakota made a net operating profit in 1945 of \$45,660, bringing the net total profit from 1919 through 1945 to \$872,592; at the close of the same year, Montana had about \$40,000 in the hail insurance fund for use in the 1946 season. The figures below show a summary of the 1945 business.

	North Dakota	Montana	Colorado
Total risk written	\$13,532,515	\$4,571,798	\$1,063,236
Premium (tax and cash)	925,550	392,132	109,264
Acres insured	1,757,886	541,998	152,945
Losses paid or adjusted	648,143	301,263	92,203 ¹
Loss ratio	4.79%	6.6%	8.68%
Operating expense ratio	11.11%	3.6%	12.26%

¹ Gross, before calculation of 80 per cent.

Federal Crop Insurance.—Crop insurance by the federal government was instituted by the Federal Crop Insurance Act (1938). It provided for the creation of the Federal Crop Insurance Corporation under the Department of Agriculture, and a capital reserve of \$20,000,000 was set up. Field administration and supervision are delegated to state and county committees of the Agricultural Adjustment Agency (AAA). It is a nonprofit program, with the government defraying all administrative costs.

Coverage is against all risks of unforeseen physical hazards, including hail, snow, excessive rain, lightning, wind, fire, drought, frost, flood, winterkill, insects, disease, and wildlife; the hazard of market price decline is avoided by providing that premium payments be calculated in bushels or pounds of the commodity insured, which need not be paid generally till about harvest time in the area, and that indemnities be paid in the same medium, that is, by certificates for the number of bushels or pounds due the insured, who may obtain their cash value from the corporation. The insurance is by farm rather than by acre. The protection is against loss of yield up to 50 or 75 per cent, at the option of

the farmer, of the average yield for the insured farm; under a trial insurance program, however, insurance against loss of investment, not to exceed 75 per cent of the investment in the crop, also is being written. Applications must be made before seeding or planting and before a closing date established for each crop. In general, a uniform rate per acre is charged for all farms in a county. Wheat is insured under contracts covering three consecutive crop years, flax on an annual basis, and cotton under a contract automatically continuing from year to year.

Federal crop insurance is not intended to take the place of insurance by private carriers. Rather does each supplement the other. Federal insurance is not designed to cover small, partial, or total losses on a part of the acreage, referred to as spot losses, against which the farmer can get 100 per cent protection through the usual insurance channels. Moreover, private insurers of hail perils do not regard federal crop insurance as contributory insurance even though the damage causing the loss might be entirely from hail; the farmer can collect from both, the only exception being that in the case of loss by fire there is reduction in federal insurance for other insurance. In the words of one of the officials of the corporation, federal crop insurance "is fundamentally for the purpose of creating catastrophe insurance and is intended to insure a minimum return to the farmer which will enable him to stay in business in case of severe loss. . . . The justification for this government insurance is not alone the need of protection of the individual farmer from the great losses which continually threaten him, but also of the welfare of those dependent upon products of the farmer and his continued income and buying power. This affects vitally alike labor, industry, trade, banking and the entire community of which the farmer is a part."

Wheat was insured during the years 1939–1943 and cotton during 1942 and 1943. In each year indemnities exceeded premiums for both commodities, the loss to the corporation running to more than \$37,000,000 for the five-year period. In the 1944 and 1945 Agricultural Appropriation acts, Congress provided funds only for liquidating the insurance on the 1943 and earlier crops, with the result that no federal crop insurance was placed on crops planted in 1944. However, the program was revived by an amendment to the Federal Crop Insurance Act and by the Agricultural Appropriation Act (Dec. 23, 1944). This amendment made changes from the previous program, designed to eliminate such deficits from future operations so that premiums should cover fully the average losses and contribute in favorable years to a reasonable surplus to offset possible extraordinary losses or catastrophes.

In order to strengthen the program and to bring crop insurance to a larger number of farmers the amendment provided for coverage of more crops. Flax was added as a regularly insurable commodity, and a progressive plan was instituted for new experimental crops, this trial insurance being limited on each commodity to a period of three years and to 20 counties. Corn and tobacco were selected for this trial insurance in 1945. No additional trial crops were added in 1946, but early in that year the corporation announced that in 1947, insurance would be extended on a trial basis to citrus fruits, potatoes, and peanuts.

Insurance was limited in 1945 to spring-planted crops because the 1944 fall-planted crops, such as winter wheat, were planted before the amendment was passed. The 1945 insurance covered 23,400 wheat farms (spring wheat), 113,000 cotton farms, 38,000 flax farms, 13,400 corn farms, and 13,200 tobacco farms, in 33 states. Applications, including those on 1946 winter wheat, were written in 1945 covering more than 540,000 farms

WOODHULL HAY,

Educational Editor, "The Weekly Underwriter."

CROPSEY, krōp'si, **Jaspar Francis**, American painter: b. Rossville, N. Y., Feb. 18, 1823; d. Hastings-on-Hudson, N. Y., June 22, 1900. For five years he studied architecture with a successful firm, and one of the outstanding jobs of his career was designing and superintending the building of the former Sixth Avenue Elevated Railroad stations for New York City. His landscape paintings brought him more distinction. He lived and studied in several European countries and is represented in the Metropolitan Museum, the Corcoran Gallery, and many private collections in the United States and Europe. His paintings include: *Old Mill, Battle of Gettysburg, Greenwood Lake, and Autumn on the Hudson River*. He helped to found the American Water-Color Society and was a member of the Artists Aid Society and the Society of Science, Letters and Arts of London.

CROQUET, krō-kā', an outdoor game played with balls, mallets, and arches, upon a court of either closely mowed grass or clay or loam soil. France introduced the game into Ireland and England early in the 17th century. Originally called Paille-Maille, meaning ball-mallet, by the French, it was anglicized as Pall Mall and gave the name to a famous street in London. After being largely neglected in the 18th century, croquet again came into vogue about 1850 (when it was first played in the United States) but ultimately was superseded in popularity by tennis. When first introduced it was a simple game with little opportunity for skill but was developed by experts until it can be as scientific as billiards.

In the United States croquet is played unprofessionally upon a level, rectangular court, often about 40 by 60 feet, although its size may vary. A wooden stake is placed at either end of the court on an imaginary straight line, at least six feet from the end lines and midway between the side lines. The nine steel wickets are placed in the following manner: Wicket 1 is two complete mallet lengths from the home stake; Wicket 2 is directly in front of and one mallet length from Wicket 1; wickets 3 and 9 are set on a line at right angles to the imaginary line from stake to stake, as are wickets 5 and 8 (3 and 9 being on a line midway between 2 and 4, while 5 and 8 are on a line midway between 4 and 6); wickets 7 and 6 are set in front of the second stake, in positions exactly similar to 1 and 2 at home stake; Wicket 4 is in the center of the court, through which the balls pass on leaving wickets 3 and 8, and a variation is to use double wickets, proving a much greater obstacle.

The balls for the game are made of either wood or vulcanized rubber, approximately 3¾ inches in diameter. A colored strip on each ball is used for identification. Mallets vary in size and weight. There are nine steel wickets (10

for the purpose of testing his veracity, explaining or modifying his testimony, or developing facts in a light favorable to the cross-examiner. In general, a person against whom a witness is called, in either a civil or a criminal case, has the absolute right to cross-examine. A person testifying in his own behalf can be cross-examined by his adversary; and a defendant in a criminal prosecution who testifies for himself thereby subjects himself to cross-examination, which he cannot prevent by claiming the constitutional privilege against self-incrimination. Although cross-examination must be confined to the issues being litigated, its extent is largely discretionary with the trial judge, and the reviewing court will not interfere except in a case of clear abuse of discretion.

RICHARD L. HIRSHBERG.

CROSS-FERTILIZATION, the combining of the heredities of different individuals by means of the union of their sex cells. This process of sexual union or cross-fertilization is the prevailing method of reproduction in nearly all animals and in many plants. The tremendous emphasis on sex and cross-fertilization in the animal and plant kingdoms has been noted by human observers since the beginning of time, and has constituted one of the outstanding problems of science. The various attempts to explain the biological significance of cross-fertilization made prior to the rise of modern genetics in the 20th century, however, were all erroneous in greater or lesser degree. The age-old problem of the reason for the existence of sexuality and cross-fertilization was finally solved in recent times by the science of genetics.

Sex and Reproduction.—It is frequently assumed that sexual union is necessary for reproduction. It is a fact that sex and reproduction are inseparably linked in higher animals. But higher animals have evolved from simple unicellular animals in which the two processes are distinct and even antagonistic. Reproduction in a single-celled protozoan is achieved by fission. One cell splits into two. Sexuality in such organisms is expressed by the conjugation of cells. Two cells become one. The whole life cycle of a typical protozoan consists of alternative phases: division of the cells leading to an increase in the numbers of individuals and hence in the reproduction of the population, and sexual conjugation between different cells resulting in a decrease in the number of individuals. Even in higher animals the basic antagonism between sex and reproduction persists, though in covert form, and thus reveals the essential and original distinctness of these two biological processes. Sexuality in the higher forms of life means that two individuals are required in order to carry out a process of reproduction which, in the absence of that factor, one individual alone might conceivably accomplish by some form of budding or splitting.

The importance of reproduction is obvious enough. It is the indispensable condition of perpetuation of the species over a period of time. But what important function is performed by sex and cross-fertilization which can account for its establishment in the life cycle even though it reduces the reproductive efficiency of the species?

Gametes.—Cross-fertilization, whether in a protozoan, worm, flowering-plant or mammal, is essentially the physical union of the gametes or sex cells produced by different individuals. These

gametes, which are usually microscopic in size form the only connecting link between generations of sexually reproducing organisms. The largest animals of sea and land and the tallest trees of the forest develop from microscopic eggs fertilized by even tinier sperm. It has been calculated that all the human beings on earth today have developed from two gallons of egg cells fertilized by a quantity of sperm cells equal in volume to a tack head. The eggs are immobile cells provisioned with food reserves, the sperm are small actively swimming cells. The important materials in the gametes, which comprises the physical basis of all heredity, is known as the germ plasma.

Genes.—The germ plasma consists of numerous protein molecules of great complexity and specificity which possess the remarkable capacity for self-duplication. These are the hereditary factors or genes. Most of the genes are borne in chains on long thread-like structures—the chromosomes, which are contained in a central nucleus in each cell of the body. Some genes apparently reside in the protoplasm outside the nucleus. The genes, in interaction with the environment, control the course of development of the organism, and hence the characteristics of the mature individuals. All the hereditary potentialities of an individual, whether it will develop to a large or a small size, have blue or brown eyes, thrive best in a warm or a cold or a dry climate, etc., are determined by the genes it acquires at fertilization, when the gametes unite.

The number of genes represented in an individual may be reckoned in the thousands. Rough estimates for the small vinegar fly, *Drosophila*, suggest that at least 5,000 or 6,000 kinds of genes, and perhaps many more, are present in this organism. Many of the genes, moreover, are represented in different forms, or alleles. In man, for example, the gene for eye color is represented by alleles for blue eyes and other allele for brown eyes. A whole series of alleles is known for the eye color gene in *Drosophila*, giving eyes of various hues of red, buff, or white. The different hair colors seen in man or other mammals, the different body colors in *Drosophila*, the different flower colors in many garden plants are often due to the expression of different alleles of some gene which controls this trait. In now, an individual with red flowers, or gray fur or red eyes crosses with an individual with white flowers, or white fur, or white eyes, the offspring of this union will have received different alleles of these genes from the two parents. The combination of different alleles in one individual may lead to some new or different expression of the gene involved. The first generation progeny of a cross between individuals differing with respect to the alleles of a certain gene-pair may be intermediate in the character in question or, more commonly, may approach the condition found in one or the other parent.

It will ordinarily happen that the two individuals which cross will differ with respect to many genes. Gregor Mendel, the father of modern genetics, crossed a pea plant with yellow round seeds by an individual with green wrinkled peas. The color and surface character of the seeds are controlled by separate pairs of genes. In the second generation derived from this cross Mendel obtained some individuals like the first parental type, other individuals like the second parent, and in addition some plants unlike either parent in that their seeds were either yellow

and wrinkled or green and round. The latter two classes of progeny are called the recombination types because they exhibit new combinations of the genes passed on to them by their original parents. *Cross-fertilization is a mechanism for bringing about the recombination of genes.* See also POLLINATION; PLANTS AND PLANT SCIENCE —Plant Breeding, Genetics, and Cytogenetics.

Adaptation.—It is becoming increasingly clear from experimental studies that natural selection, which favors the better adapted individuals in the struggle for existence, operates not so much on single characters as on character combinations. Adaptation of organisms to their environments involves whole ensembles of characteristics. In mankind, for example, the traits of brown skin, dark hair, and brown eyes seem to be adaptively superior in tropical climates, whereas the alternative combination of blond skin, hair, and eyes appears to be better fitted

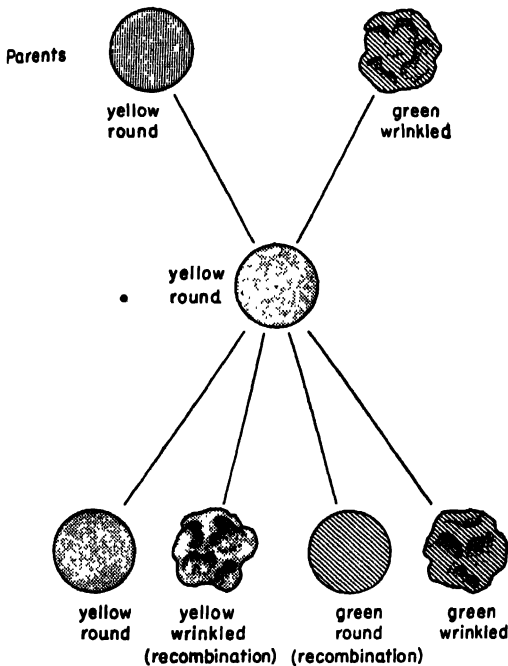


Fig. 1. The appearance of recombination types in the second generation progeny of the cross of a yellow round by a green wrinkled pea

for human inhabitants of northern forest environments. The races of man which occupy respectively the contrasting environments have come to differ in the whole character complex.

Less familiar but better founded examples of the importance of character combinations for adaptation occur among many other species which have been analyzed by naturalists and geneticists. The black mustard, *Brassica nigra*, is a weed of widespread occurrence in Asia Minor. One race of this species has become specialized as a weed in fields of the cultivated yellow mustard. It differs from the less specialized races of the same species in at least eight separate characters involving habit of branching, height of stem, size of flowers and of seeds, and time of flowering. A close analysis of these differences reveals that they all help the black mustard to mimic the cultivated yellow mustard. The success of the former as a weed in fields of the latter is due to the fact that it grows and ripens simultaneously

with the cultivated plant and is harvested, threshed, and dispersed with it. Its adaptation is based not on any one single feature but on a set of characters.

Let us imagine a population of animals or plants with a set of five characteristics symbolized by $A B C D E$. The letters also symbolize the genes which determine these different characters. Now, the character combination $A B C D E$ was advantageous in the environment formerly inhabited by this population. But the climate has changed during the course of time; new environmental conditions were established for which the combination $A B C D E$ is no longer well adapted. Adaptation of the organism to its new circumstances can be secured by the combination of characters $a b c d e$. To succeed in this new environment the genes $A B C D E$ must be replaced in the population by a new set of alleles $a b c d e$.

Mutation and Recombination.—There are two ways in which a set of genes can be assembled in an individual. The first and least efficient is the mutation or permanent and hereditary change of the genes from one allelic form to another. Gene mutations do occur spontaneously in nature as relatively rare events in the life of every kind of organism. The gene B may mutate to b once in 100,000 generations. The new individual is then $A b C D E$. But since adaptation involves the whole gene complex, this mutant individual is little or no better adapted to the new environment than its predecessors. Meanwhile, another individual in the population has acquired a mutation in gene D to the allele d . Its constitution $A B C d E$ does not fulfill the requirements for adaptation to the new conditions either. The chances of a series of simultaneous or successive mutations of all five genes occurring in one individual or one immediate line of descent, to give the new combination $a b c d e$, are infinitesimally slight. For most kinds of animals and plants the probability of a new and adaptive combination of five genes becoming assembled in one individual as a result of chance mutations alone is so small that this event is unlikely to occur even once during the whole evolutionary history of the species. When we consider that most adaptations in nature are far more complex than our hypothetical case, in that the interaction of many more than five genes is necessary in order to attain them, we can gain some appreciation of the limitations of the mutation process by itself as a method of assembling desirable new gene combinations.

If, however, the various mutant individuals can cross sexually, they can pool the mutations which they have individually acquired and produce the new recombination type directly. Cross-fertilization of the two individuals $A b C D E$ and $A B C d E$ will give several classes of offspring among which are individuals of the constitution $A b C d E$. Other individuals in the population representing the mutant types $a B C D E$, $A B c D E$, and $A B C D e$, may intercross with one another and with the first two mutants. Such crossing will lead to the reshuffling of the genes; various new recombination types, including the desirable one, $a b c d e$, will emerge out of the shuffle. The combination of mutant genes which could not be assembled by the mere chance of simultaneous multiple mutations once in millions of generations is readily brought together in a few generations by means of crossing between the various mutant types.

Herein lies the great role in nature of sex and cross-fertilization.

The Breeding Population.—Individuals of a cross-fertilizing species are tied together in interbreeding populations by bonds of mating and parenthood. The population may be enormously large in the case of an extensive forest of pine trees or the erstwhile bands of passenger pigeons; it may be a small-sized colony numbering only a few hundred breeding individuals in a grove of Monterey cypress or the semi-isolated breeding colonies of geese. Whether small, large, or medium-sized, the population represents an accumulation of hereditary variations, a pool of genes, which is shared by the individuals constituting the population. Such a population is a dynamic entity. Cross-fertilization is constantly bringing about new combinations of the various gene alleles. Many of the character combinations produced by the novel gene recombinations are poorly fitted for the existing environment and are rejected by natural selection: the individuals possessing an unadaptive genetic constitution contribute less than an average number of descendants like themselves to the next generation. Other new recombination types generated by cross-fertilization may represent improvements upon the average level of adaptation of the population to its surroundings; such gene combinations will tend to be perpetuated by natural selection. The frequency of certain gene alleles in the gene pool will thus increase while the frequency of other alleles decreases.

Self-fertilizing or asexual organisms cannot form interbreeding communities of this sort. The integration brought about by mating bonds, and the evolutionary advantages arising from the sharing in a common gene pool, are impossible in sexless forms of life. Such organisms form aggregations of asexually reproducing individuals, called clones, each one of which stands alone with respect to the generation of new hereditary variations.

It is not difficult to understand why most contemporary species of animals and plants, the present-day representatives of the successful lines of evolution, reproduce by means of cross-fertilization. As stated by the geneticist Hermann J. Muller: "There is no basic biological reason why reproduction, variation, and evolution can not go on indefinitely without sexuality or sex; therefore sex is not, in an absolute sense, a necessity, it is a 'luxury.' It is, however, highly desirable and useful, and so it becomes necessary in a relativistic sense, when our competitor-species are also endowed with sex, for sexless beings, although often at a temporary advantage, can not keep up the pace set by sexual beings in the evolutionary race, and when readjustments are called for, they must eventually lose out."

Systems which Promote Outbreeding.—Cross-fertilization is brought about in the vertebrate animals, the insects and other arthropods, and some kinds of seed plants (cycads, junipers, willows, hemp, some palms, etc.), by the simple device of dividing the breeding population up into two kinds of individuals, males and females, neither one of which is alone sufficient for reproduction of the species. The original meaning of the word sex, derived from the Latin root *seco*, to cut, refers to the division into male and female forms. From the standpoint of a geneticist, the presence of males and females is superstructure. What is essential about sexuality is not the sub-

division of the population into different kinds of individuals, but the combination of different heredities which this arrangement accomplishes.

Most flowering plants and some animals such as snails, worms, and sea squirts are hermaphroditic. A single individual possesses both male and female organs. Self-fertilization may be prevented, however, by various devices, both mechanical and physiological. The stamens (male parts) and carpels (female parts) of a flower may ripen at different times. These organs may be of different lengths or so disposed in the flower that they do not normally come into contact (see FLOWERS). The female organ in snails and worms is normally inaccessible to the sperm of the same individual. Copulation is consequently a mutual affair in which two individuals exchange sperm. Furthermore, the male and female gametes produced by the same individual may be incompatible and fail to effect fertilization even if they do meet. Self-incompatibility, the obstruction of self-fertilization by physiological blocks, occurs in the sea squirt *Ciona* and in numerous plants.

Specific genes are known in a number of flowering plants which cause a failure of pollen tube growth in the styles of the same individual. The self-incompatibility gene, *S*, is represented in the population by a series of

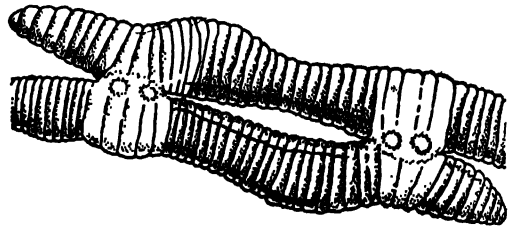


Fig. 2. Mating of two earthworms. In this hermaphroditic organism each individual bears both male and female sex organs on its lower side. During copulation two worms stretch out with their ventral surfaces in contact, their heads pointing in opposite directions, and exchange masses of sperms.

alleles, $S_1, S_2, S_3, \dots, S_n$. Fifteen alleles of the *S* gene have been found in tobacco, 37 in the evening primrose, 40 in red clover, and it is probable that the total number of alleles within any one self-incompatible species may be reckoned in the hundreds. An individual possessing the alleles S_1 and S_2 (written S_1/S_2 in the shorthand of genetics; two alleles of each gene are present in the body cells of higher plants and animals) will not set seeds either with its own pollen or with that of any other S_n/S_m individual. All the S_n/S_m individuals in the population thus form an incompatibility type; selfing or interbreeding among the members of the group is opposed by the incompatibility gene, but the members can cross freely with individuals belonging to any other incompatibility group. Owing to the large number of alleles of the *S* gene, scores or hundreds of such incompatibility groups are present in the population. The promotion of outbreeding, which is accomplished by the sexes in bisexual animals and plants, is carried out by the incompatibility types of hermaphroditic organisms.

Among the protozoans, bacteria, and many algae and fungi there is no recognizable differentiation of the gametes into sperm and eggs. The gametes, as observed under the microscope, are identical in appearance. They may be produced in special organs, which, however, are not dif-

ferentiated into male and female; or, in the unicellular forms, the gametes which unite at fertilization may be the whole individual organisms. In any case, a morphological distinction between male and female gametes, sex organs or individuals is not discernible. Nevertheless, the gametes and the organs and individuals which release them are not all entirely alike physiologically. This is indicated by the fact that cross-fertilization can be successfully accomplished by certain combinations of individuals and not by others. Systematic breeding tests show that the population is composed of different mating types, similar to the incompatibility groups found in many flowering plants. The commonest situation is perhaps the separation of the population in just two mating types, usually labelled the plus and minus strains, between which crossing can take place. More than two mating types exist in certain fungi. The existence of two or more mating types obviously brings about outcrossing in the microorganisms.

Asexual Reproduction.—Cross-fertilization is the only means of reproduction among the mammals, birds, reptiles, amphibians, fish, and most insects. In many other kinds of living beings the

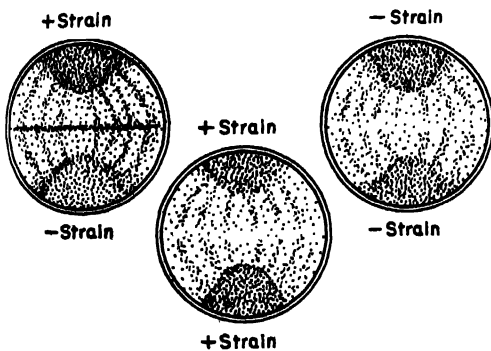


Fig. 3. Petri dish cultures of the different combinations of two strains of a mold. The combination of a plus and a minus strain leads to cross-fertilization and the formation of black fusion cells along the line of contact, whereas two like strains of mold come into contact without interbreeding.

sexual process is supplemented by some asexual method of propagation. Many perennial plants reproduce sexually by seeds and in addition spread vegetatively by creeping stems (for example, strawberries), underground rhizomes (iris), stump sprouts (poplar), or the like. Most of the multiplication of aphids throughout the summer is by asexual means. The females are specialized for giving birth to living young parthenogenetically; their eggs develop without fertilization by sperm. At the end of summer, however, a sexual generation is produced, and the eggs which are laid to overwinter are the products of cross-fertilization. Asexual reproduction by fission alternates with periods of cross-fertilization and gene exchange in unicellular organisms such as protozoans, the simplest algae, and some bacteria.

The potentiality for self-fertilization exists in all hermaphroditic organisms and is actually realized in a great many cases. Not all hermaphrodites possess those mechanical or physiological barriers which make outcrossing obligatory. Some hermaphroditic pond snails, for example, regularly reproduce by self-fertilization. Self-fertilization is the rule in many cultivated plants,

such as tomatoes, peas, wheat, and barley, and in many species of annual wild flowers.

Furthermore, many kinds of organisms derived from sexual and cross-fertilizing ancestors have given up sexuality and currently reproduce entirely by asexual means. This is the case in the common dandelion and blue-grass among flowering plants, and in the great group of Fungi Imperfecti. In certain brine shrimps, grasshoppers, moths, weevils, and earthworms the females produce eggs which develop parthenogenetically, without fertilization, into new individuals.

Fitness and Flexibility.—The diversity of breeding systems in the living world is at first sight a source of perplexity. A theory has recently been advanced by comparative geneticists which attempts to simplify and unify the great variety of reproductive systems by expressing them as different permutations of two common elements. The two elements pervading all types of life cycles are fitness and flexibility. Each one of these two qualities is indispensable for a successful species. Without fitness, the adaptation to its immediate surroundings, the organism cannot begin to survive. It is equally necessary for its survival that it be capable of responding by genetic variations to the inevitable changes in its environment. It must be flexible as well as fit in this world of change.

Fitness, once built up by crossing and gene recombination in interaction with natural selection, can also be broken down by the same sexual process. Cross-fertilization can bring together an adaptive gene combination; it can also break it apart. But the adaptive gene combination can be preserved and passed on intact to future generations if the sexual process is circumvented by self-fertilization or some kind of asexual multiplication. The circumvention of cross-fertilization may not be an unmixed blessing, however, for while it preserves the integrity of an existing gene combination, it also prevents the formation of new and possibly better combinations. The sacrifice of long-range flexibility in the interest of immediate fitness may be disadvantageous in the long run, particularly if the environmental conditions should shift away from the older adaptive combination. The history of life is full of examples of species which have become invariable and stereotyped and therefore have been restricted to small relictual areas or exterminated altogether.

The breeding system of each species represents a compromise between immediate fitness and long-range flexibility. This compromise is manifested in the relative roles which sexual and asexual processes play in reproduction. Cross-fertilization, as the main source of flexibility, must strike a balance with self-fertilization and asexual multiplication, as the means of preserving fitness in the interest of the successful functioning of the organism. The happy medium between fitness and flexibility is not necessarily the same for all kinds of organisms or at all times in their life histories.

Aphids to expand their populations on plant leaves during the summer months, bacteria to multiply in a favorable medium, irises or strawberries to spread over a spot of ground, many annual wild flowers to produce an abundant crop of seeds during their single season of growth may be best served by an ability to reproduce rapidly without the agency of cross-fertilization. In this way a gene combination,

the fitness of which has already been tested and passed upon by natural selection, can be rapidly multiplied and passed on to the hundreds, thousands, or millions of individuals who will colonize and exploit some available habitat. The relatively slight amount of flexibility which is necessary for the maintenance of a high adaptive level in the face of environmental changes may be secured in such organisms by occasional periods of crossing and gene exchange.

The equilibrium point between optimum flexibility and fitness lies much more on the side of gene recombination in the case of the dominant trees of the forest, the dominant bunch grasses and perennial herbs of the steppe, and the shrubs of the deserts and brushlands. Competition for Lebensraum is strong, and the race goes to the seedling with the best adapted gene combination in each particular site. Cross-fertilization is the predominant or even the sole method of reproduction in such types of plants. An even greater emphasis on gene recombination, as compared with asexual methods of propagation, is found in the higher animals, both vertebrate and invertebrate. The enormous complexity of the body of such organisms and the corresponding complexity of the relations between the organism and environment do not allow of one simple genetic formula for fitness, which can be multiplied indefinitely by asexual means. In fact, the power of asexual reproduction is wanting entirely among the majority of the higher animals, with the exception of a limited ability to regenerate lost parts belonging to individual bodies. Reproduction in higher animals is, with rare exceptions, synonymous with cross-fertilization.

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VERNE GRANT,
Rancho Santa Ana Botanic Garden, Claremont,
Calif.

CROSSBREEDING AND INBREEDING

It has been known for a long time that certain general rules apply to crossbreeding and inbreeding, although these rules have many exceptions. They are: (1) inbreeding tends to make a stock more homogeneous, and may lead to a decline in vigor; (2) crossbreeding increases the variability of a stock, and often leads to an increase in vigor. Both of these rules can now be explained on the basis of the Mendelian theory of inheritance.

According to Gregor Mendel's theory, which since its rediscovery in 1900 has been thoroughly substantiated experimentally, characters of animals and plants are determined by the units of heredity called genes, and each individual possesses two genes (not necessarily exactly alike) of each kind, one from his father and one from his mother, and he transmits one of each pair to each of his descendants. From this simple fact it can be shown mathematically that if close relatives mate, the offspring will tend on the whole to have both members of each gene pair exactly alike, and will resemble each other, as a result, more closely than would the offspring of random

matings. After a certain number of generations of inbreeding no more individuals with unlike pairs of genes (heterozygotes) will be found, all individuals produced will now have like genes in each pair (will be homozygous), although these pairs may be of either kind. The variability of an inbred population is thus decreased. This prediction has been fully verified by experiment (for example, Sewall Wright's work, 1922 and 1929).

Crossbreeding increases to a maximum the number of individuals having the different members of the various pairs of genes unlike each other. This makes the variability of the stock as great as is consistent with its supply of genetic material. In addition, crosses often display what is known as hybrid vigor. An example of hybrid vigor is the mule, a cross between two different species, the horse and the ass. The mule is larger and stronger than the ass, has much the same strength and speed as the horse and possesses also the sure-footedness, endurance, and lack of excitability of the ass.

The explanation of the decrease in vigor resulting from inbreeding is that in general genes are of two kinds, dominant and recessive, and the latter do not manifest their effects in an individual who possesses also a paired dominant gene. Many of the recessive genes are deleterious, but do not produce their effects in the heterozygotes. Inbreeding brings them together in the resulting homozygotes, and such homozygous recessive individuals are inferior. Conversely, crossbreeding, by reducing the numbers of such homozygous individuals to a minimum, improves the stock (at least temporarily). Some of the genes which influence vigor may exist in homozygous form (each member of a gene pair just like the other) in pure inbred stocks, and cross fertilization may result in the production of heterozygous individuals in which most of the pairs of genes influencing vigor contain one of the dominant genes which make for greater vigor. This phenomenon is made use of commercially in the production of hybrid corn, where inbred strains of corn, free from abnormalities but distinctly unimpressive to look at, are crossed to produce large vigorous plants with high yield.

Inbreeding is not a disadvantage, even in the absence of selection, in a stock free from undesirable recessive genes, and it has been practiced in certain instances in man without bad effects, as in the brother-sister matings in the royal families of Ancient Egypt. Inbreeding is useful in eliminating defects, if coupled with a high degree of selection, as in domestic animals. It serves to bring out the characters in pure form, and the desirable ones can be retained. The majority of the various breeds of cattle have been improved to their present degree by the aid of close inbreeding. In animals where inbreeding has not been practiced, the first result is often a marked deterioration of the stock, as in chickens.

In man close inbreeding has often been forbidden by custom or taboo, and a certain degree of crossbreeding (exogamy) required. Whether this has been based on an obscure recognition of the bad effects of inbreeding, or solely on totemistic or ritualistic grounds, is not clear. It is a fact that undesirable hereditary conditions tend to be commoner in the offspring of related parents.

Crosses between different human races often seem to produce hybrid vigor, just as in lower animals and plants, and the abilities of the an-

cient Greeks, the modern French, the English, the Germans, and the Americans have been attributed by some to their hybrid origins. Nevertheless, in some countries the mating of persons of visibly different races, in particular of different color, is frowned upon, and in some places it is against the law. It is true that the offspring of such matings may find themselves in a socially stigmatized group, and may suffer as a result, but there is no reason to think such matings are bad for the stock. The studies which have been made suggest the contrary. The offspring of mixed Indian-white unions in the United States were analyzed by Dixon, who found them to have a higher fecundity and vitality than the pure Indians. Half bloods are generally taller than either parent race, and thus show hybrid vigor. Studies of the crosses between Hottentots and white Boers in Africa showed the offspring to be taller than either parent race and to exhibit a high fecundity and vitality. The offspring of the English and Polynesians in Pitcairn's Island are physically a superb group.

Those who object to race crossing in man often allege that the offspring are inferior mentally, and it is often claimed that some races are less intelligent than certain others. There is no scientific evidence for this; some of the so-called intelligence tests formerly used which seemed to reveal such differences have been shown to depend upon some something which is learned in urban as opposed to isolated rural environments, not on inherent native intelligence. So far as we know at present, genes for mental ability are distributed more or less evenly among the various human races.

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WILLIAM C. BOYD,

Professor of Immunochemistry, School of Medicine, Boston University.

CROSS FOX, a color variety of the common American red fox (*Vulpes fulva*). Its parents may be ordinarily colored. The name is derived from a dark cross on the shoulders of the individual. The pelt of the cross fox is more highly prized than that of the normally colored red fox.

CROSS IN MYTHOLOGY. See NATURE WORSHIP; SWASTIKA.

CROSS KEYS, Virginia, formerly a post village in Rockingham County, 20 miles north-east of Staunton, where a battle took place June 8, 1862, between the Union and Confederate forces. The engagement was a strategic success for the Confederates.

CROSS KEYS, Battle of, an engagement of the American Civil War fought near Harrisonburg, Va., June 8, 1862. Gen. John C. Frémont, the Union commander, with 10,000 infantry, 2,000

cavalry and 44 guns, was pursuing "Stonewall" Jackson up the Shenandoah Valley. His leading brigade, commanded by the French Gen. G. P. Cluseret, contacted Gen. R. S. Ewell's division (6,000 infantry and 500 cavalry) at Cross Keys. Two Union brigades were committed to Cluseret's right, and two to his left. Ewell's counterattack on the Union left was successful and the entire line fell back to reorganize at 6 p.m. Frémont badly mismanaged his battle plan. Union losses in killed, wounded and missing were 684, while those of the Confederates were 288.

CROSS-VINE. See BIGNONIA.

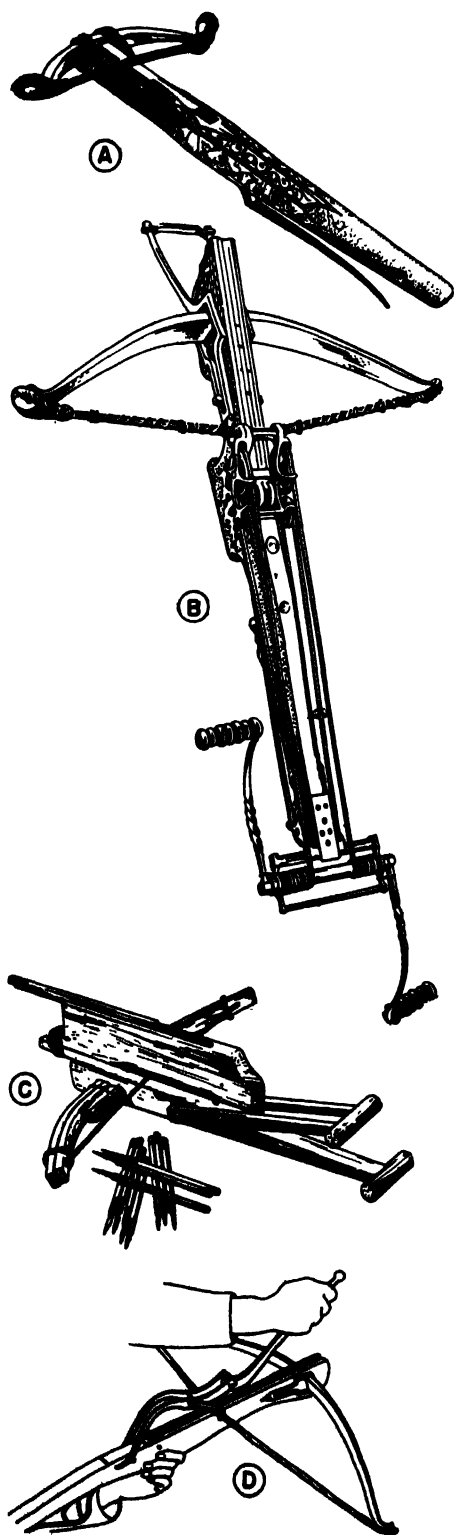
CROSSBILL, krös'bil, a bird of the genus *Loxia*, belonging to the finch family (Fringillidae), and having an unusual bill, the mandibles of which are much curved and cross each other at the points when the bill is closed. This enables the bird to obtain the pine seeds, which are its chief food, by tearing apart the scales of the cone with a strong lateral movement of its mandibles and removing the seed with its tongue, which has a scooped bony tip. The birds are native to the Northern Hemisphere where they live mostly in the pine and spruce forests and go about in small, chattering flocks. They breed in the very early spring and build their nests of twigs, bark, and moss usually in the branches of conifers and well above the ground. The eggs are pale bluish-green with brownish and lavender spots near the larger end.

Two species of crossbill common to North America are the red crossbill (*L. curvirostra*) and the white-winged crossbill (*L. leucoptera*). The males of both species are red with black wings, the latter species having two white bars across the wings; the females are olive brown. According to an ancient legend, the bird in pity tried so hard to draw the nails holding the Saviour's hands and feet to the cross, that its bill became crossed and its plumage tinged with His blood.

CROSSBOWS (also called ARBALESTS) are bows mounted at right angles upon a tiller, or stock, with a top groove for the arrow and a cylindrical catch, called a nut for catching and holding the string and a trigger for releasing it—the whole arranged to be discharged from the shoulder as with a modern rifle. Early crossbows had wooden bows and were braced (the string drawn to the nut) by hand, a stirrup at the bow end receiving the foot while the hands drew the string. Later came composite bows (made of whalebone, or horn, wood, sinew, and glue) and eventually bows of steel.

Bracing.—The methods of bracing the stronger crossbows varied: by cord and pulley—the cord, one end attached to the belt the other to the bow stock, passed through the pulley a hook on which engaged the bowstring; by gaffie—a hook attached to the belt; by a goat's foot lever, or hind's-foot (*pie-de-biche*)—an articulated lever with hooks for the string at one end and two long prongs at the other to slide over lugs in the sides of the stock and act as a moving fulcrum when the lever was drawn backward; by a windlass, or block and tackle arrangement; by a cric (Fr.; Eng. crick), or *cranequin*—a crank with gears acting on a toothed rack with hooks for the string at one end and a cord loop at the other to slip over the stock.

Each of these devices was attached, used, and detached, every time the weapon was fired.



(A) Hungarian, with composite bow, 15th century; (B) French, with windlass in place, 16th century; (C) Chinese, self-loading, repeating crossbow and darts, 18th century; (D) "goat's-foot lever" in use to draw crossbow string, 16th century.

It was partly because of the length of time required to brace the crossbow that its use in warfare was limited. The longbowman could shoot six or more arrows to every bolt loosed by the crossbowman. Yet its greater range made it indispensable in the defense of fortifications while its silent discharge suited it admirably for hunting. Though the crossbow was generally superseded in open warfare by the handgun in the beginning of the 16th century, it was popular with sportsmen and foresters for more than a century longer.

In some of the heavier, more powerful steel crossbows, the pull on the bowstring when drawn to the nut was well over half a ton. The string was made of pure hemp or flax cord formed into a many-stranded skein with loops at both ends and had to be put in place with the aid of a bastard string which bent the bow far enough to allow the (shorter) bowstring to be slipped over its ends. Thus the string of a crossbow stayed in place once it was strung. Many of the early composite crossbows had bows without curvature (or with slight reverse curve) when unbraced—the bowstring hanging slack when not in use. Crossbow arrows are called bolts, or quarrels, are short and relatively heavy, and are feathered with wood, leather, or parchment vanes.

Types of Crossbows.—The *arbalète-à-jalet* (or *galet*) or prod (also prodd)—a small, lightweight, hand-spanned crossbow for shooting pellets or stones to stun or kill rooks, rabbits, and other small game, was introduced about 1500. It had a stock curved downward between bow and nut and a double bowstring with a small string pocket, or cradle, to hold the stone missile. A somewhat later and stronger weapon for the same purpose, also called a prod (or prodd) or pellet bow, had a built-in steel spanning lever and a stock of metal. Pellet bows were used well into the 18th century. The slurbow, introduced about the same time, had a wood or metal barrel attached to the stock. The barrel, doubtless suggested by the handgun, was slotted at the sides to allow the bowstring to move back and forth along the stock, and featherless bolts, not bullets, were the missiles used.

Crossbows, though generally thought of as medieval weapons, were in use in Roman times and also by the Chinese prior to the Han Dynasty. Some of the ballistas of ancient and medieval times were merely huge crossbows braced by handwheels working a worm-screw-nut mechanism. The Second Lateran Council in 1139 (and Pope Innocent III later), interdicted the use of crossbows, except against infidels, as barbarous "because of their frightfulness," a prohibition which had little effect. Richard I of England (r. 1189–1199) and Philip Augustus of France (r. 1179–1223) armed some of their crusaders with crossbows. The weapon was subsequently replaced in England by the longbow while its use continued on the continent. At the Battle of Crécy in 1346 the French were credited with having at least 6,000 Genoese arbalesters (crossbowmen), though the English won the day with the longbow.

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RANDOLPH BULLOCK,
Associate Curator, Department of Arms and
Armor, Metropolitan Museum of Art, New
York.

CROSSES AND CRUCIFIXES. The cross in varying forms has been used almost universally as a symbol and ornament. It has represented variously the sun or the god of the sky, the four parts of the world, the four main winds that bring rain, the four elements—earth, air, fire, and water. The simple cross (+), widely and continuously depicted in both the Old World and the New World, dates from palaeolithic times, the oldest known being on pebbles found in Le Mas d'Azil in Southwestern France.

From the bronze age objects of many types bore a variety of cross forms, including that later named the Maltese cross (✠). A frequent and widespread type was the swastika (卐), also called Thor's hammer; the word is Sanskrit and the symbol nearly always served as a kind of talisman. Its origin is uncertain and its symbolism diverse, though frequently it represented the four points of the compass. Equally obscure is the history of the ankh (⚡), the Egyptian hieroglyph for life. The T shape (Greek letter tau) was used as a cross in the ancient Mediterranean world, being a common form for crucifixions. The Hebrew letter *thau*, having the T form in epigraphy and meaning sign or cross, had a sacred meaning for the Israelites, and in Ezekiel 9:4 is referred to as a sign made on the forehead.

In the apostolic age only St. Paul regarded the cross as sacred, but by the 2d century the cross was virtually the synonym for Christianity. The tau (*crux commissa* or *patibulata*, called the gibbet cross, or St. Anthony's cross) was the generally accepted form. Tertullian in the 3d century called the T the "true form of the cross," and mentioned it as the frequent gestural sign of the cross in daily and liturgical duties.

The simple or Greek cross (+), utilized for the Cross of St. George, may have been used as early as the 1st century, as on some Palestinian sarcophagi believed to be Christian. The Latin (†) cross (*crux immissa* or *capitata*) was found in a house, probably a cult place, in Herculaneum and must therefore date no later than 79 A.D. But representations before the 4th century are rare, so great was the fear of persecution, the abhorrence of idolatry, and the stigma of crucifixion.

Pagan symbols served as disguises—the tau, the swastika (*crux gammata* or, in Anglo-Saxon, *fyfot*, meaning many-footed), and the ankh (*crux ansata*) adopted by the Coptic Church of Egypt. The latter seems to have been almost exclusively Egyptian and when found elsewhere seems to have been inspired by Coptic custom. The tau, used in the Roman catacombs, might be hidden in a name, IRETNE, for example, or the actual letter T forming part of the name might be enlarged. A very common disguise in the 2d century was the anchor, itself a symbol of hope. Other objects were assimilated to the cross shape—trident, ship, orant (figure with arms outstretched in prayer), bird in flight, hatchet. The chrismon or so-called Constantin-

ian monogram (✠), used in pagan times as an abbreviation, was adopted by the Christians in part because it combined the Greek letters *chi* and *rho*, the beginning of the word *Christos*. It became a symbol of the Cross of Christ and was first used in epitaphs.

Constantine's vision of the Cross in 312, the official recognition of Christianity by the Edict of Milan in 313, and the traditional finding of the True Cross in Jerusalem by Helena in 326 stimulated public acceptance of the undisguised cross. From that time the Cross symbolized the triumph of Christianity. Constantine erected in the Roman Forum a statue of himself holding a cross-shaped lance. The Constantinian monogram was used on the *labarum* (military standard). The Cross appeared in the imperial diadem and scepter and in many shapes on imperial coinage.

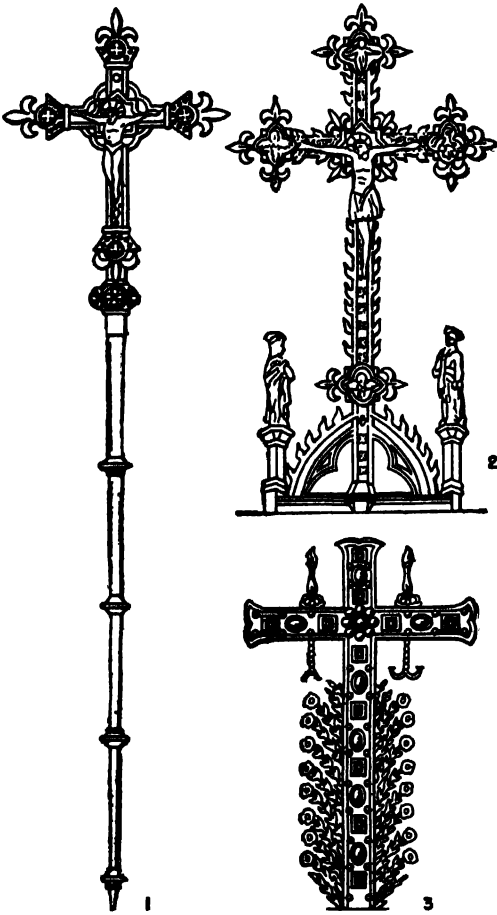
Only late in the 4th century, however, did the triumphal cross receive monumental expression, as in the apse mosaic of Santa Pudenziana in Rome. This is a Latin cross, the type on which Christ is believed to have been crucified, and is covered with gems. Such jeweled crosses (*crux gemmata*) as well as foliated crosses were popular from the 5th century and at least that early a gemmed cross stood on Calvary.

The Latin cross was common everywhere until the Great Eastern Schism in 1054 when the Greek equivalent became more general in the East. Two other forms used in the 4th century, but known in pre-Christian times, were the monogrammatic cross (✠) and the *crux decussata* (X). The latter is called both St. Patrick's and St. Andrew's cross, the latter because it is the type on which, according to legend, St. Andrew was crucified. Used sporadically from the bronze age, it has been adopted as the national cross of Scotland.

Crucifixes.—The abolition of punishment by crucifixion in the 4th century lessened the repugnance to depicting Christ on the cross. The earliest records of a crucifix—a cross, generally of Latin type, bearing only the body of Christ—refer to its use in Syria, possibly in the 6th century. Monumental crucifixes probably originated in Syria where they were especially common among the Nestorians who upheld the humanness of Christ. The Monophysites of Syria and Egypt, who denied His mortal nature, used either the plain or decorated cross, like the richly jeweled Coptic crosses. By the 8th century there were certainly both sculptured and painted crucifixes in Syria. The latter continued in use in the East, and at Mount Athos a large painted crucifix is still raised in the middle of the iconostasis (the partition between the altar and the choir or nave of the church).

The crucifix, like the scene of the crucifixion, was rare in the West in the early Christian period and was probably introduced by Eastern monks and artists. Early crucifixes were usually flat with incised figures. There are references to painted wooden crucifixes of the Carolingian period, generally placed in the middle of the nave on a column, behind the altar or in front of the choir. After the Carolingian period they were largely replaced by sculptured crucifixes. The earliest extant examples date from the late 10th or early 11th century and are relatively small, like the Gero and Werden (Germany) crucifixes.

Monumental sculptured crucifixes were very



1. Processional cross. 2. Rood cross. 3. Gemmed and foliated cross, 8th century.

popular in the Romanesque period, with the change from the early Christian type of altar with baldachin to the medieval retable altar. They were encouraged by the full development of the liturgy of Good Friday with its adoration of the Cross. Monumental crucifixes were placed not only on altars but also on rood screens separating the nave (the church militant) from the chancel (the church triumphant).

In the 12th century the painted crucifix reappeared in Umbria and Tuscany and remained peculiar to Italy. Like many sculptured crucifixes it continued the Carolingian use of enlarge-



Sculptured cross at Monasterboice.

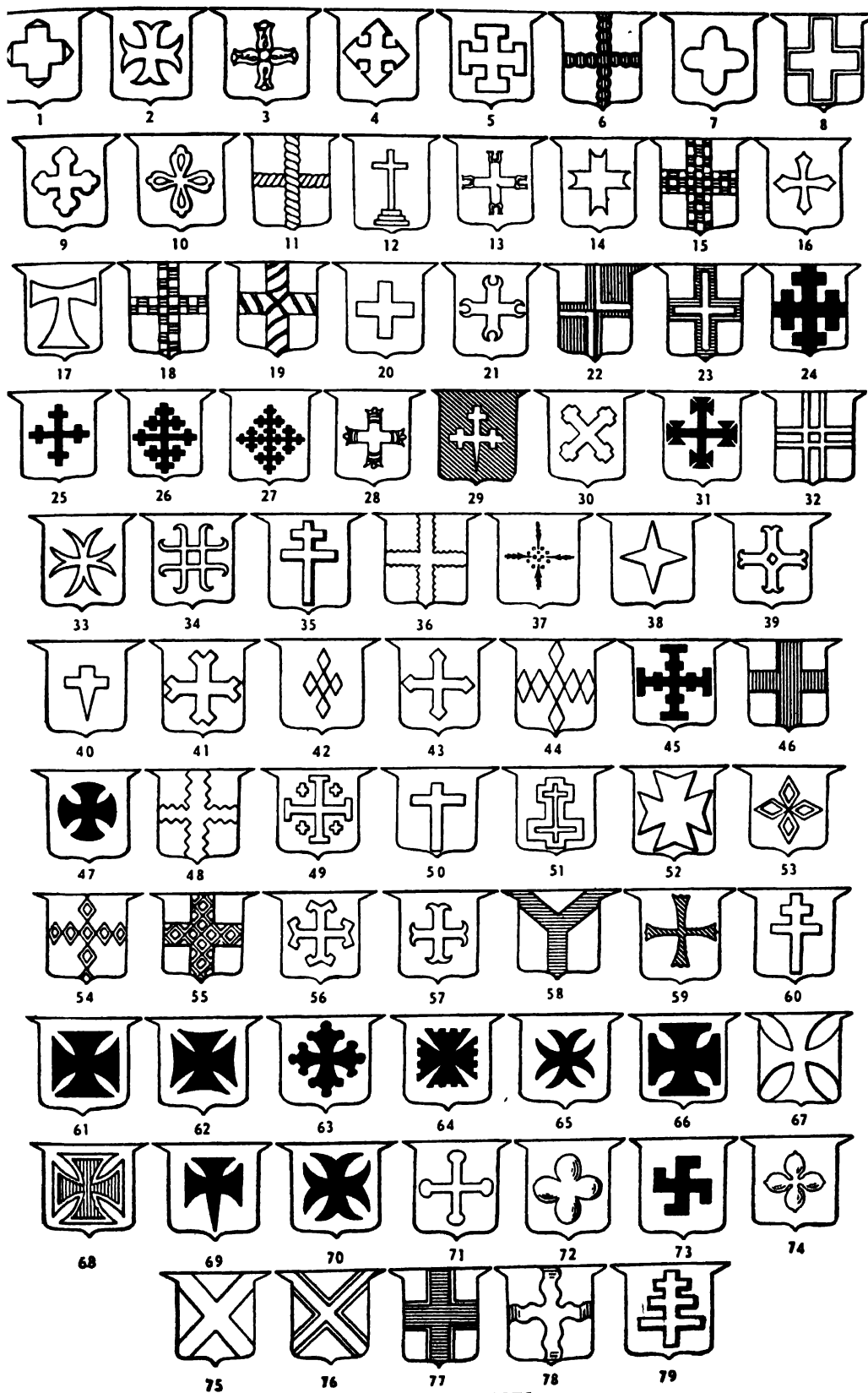
ments at the ends of the arms and upright. With secondary figures in the extensions and often scenes of the Passion around the body, these painted crucifixes pass from the realm of crosses into that of the Crucifixion.

The iconography of the crucified Saviour, whether fully clothed or wearing only the loincloth, whether alive or dead, usually paralleled the fashion in the larger Crucifixion scenes (See CRUCIFIXION.) Painted crucifixes of Italy showed Christ nude, both living and dead. By the 14th century, particularly in Germany, the suffering Christ was replacing the classic calm Romanesque type of Christ triumphant over death.

In the first centuries of the Christian era the cross was almost exclusively a sepulchral decoration. Later it was also adopted as the shape of freestanding memorials, monumental crosses like those of Bewcastle (England) and Ruthwell (Scotland) of the 7th century. Such crosses, often elaborately sculptured, were erected in Celtic countries possibly as early as the 5th century and were especially important in the British Isles throughout the medieval period. Cruciform shafts served as guides to travelers, as preaching crosses, as landmark or boundary stones. Roadside crosses, ranging from simple crosses and crucifixes to elaborate calvaries, abound in Europe and Quebec. Market crosses,

CAPTIONS OF HERALDIC CROSSES

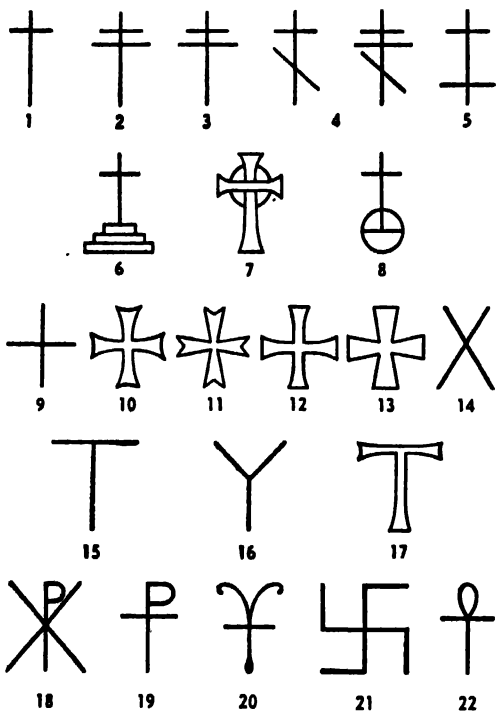
- (1) Cross aiguisée. (2) Cross ancrée. (3) Cross avellane. (4) Barbed cross. (5) Cross potent. (6) Cross bezantée. (7) Cross blunted. (8) Bordered cross. (9) Cross botonée or treffée. (10) Cross botonée pattée. (11) Cross cabled. (12) Cross Calvary. (13) Cross catoosed. (14) Cross chappée or cross double fichée. (15) Cross checky (chequy). (16) Cross urdée. (17) Tau cross or cross of St. Anthony. (18) Cross counter-componee. (19) Cross corded. (20) Cross coupé or humetty. (21) Cross crescented. (22) Cross counterquartered. (23) Cross coursi voided. (24) Cross crénelée. (25) Cross crosslet. (26) Cross crosslet crossed. (27) Cross crosslet double crossed. (28) Cross crowned. (29) Cross crosslet fichée. (30) Cross crosslet in saltire. (31) Cross crosslet pattée. (32) Cross double parted. (33) Cross moline anchored. (34) Cross double parted fleury or flory. (35) Cross double portante. (36) Cross engrailed. (37) Cross ermine. (38) Cross estoile. (39) Cross fer-de-moline pierced lozenge of the field. (40) Cross fichée. (41) Cross fourchée. (42) Cross fusil. (43) Cross fusil at each end. (44) Cross fusilly. (45) Cross gemelle or cross potent crossed. (46) Cross of St. George. (47) Cross globical pattée. (48) Cross indented. (49) Cross of Jerusalem. (50) Latin cross or Passion cross. (51) Cross of Lorraine voided. (52) Cross of Malta. (53) Cross masle. (54) Cross masley or cross of masles. (55) Cross masculy. (56) Cross miller. (57) Cross moline. (58) Pall cross. (59) Cross patonce. (60) Patriarchal cross. (61) Cross pattée or formée. (62) Cross pattée concaved. (63) Cross pattée botonée or cross of Toulouse. (64) Cross pattée crénelée. (65) Cross pattée double fiched or anchored. (66) Cross pattée double rebated. (67) Cross pattée entire. (68) Cross pattée fimbriated. (69) Cross pattée fichée. (70) Cross pattée moline. (71) Cross pomelled, pommelle, or crowned-pomel or bourdonnée. (72) Cross of four pomels. (73) Cross potent rebated, fylfot or swastika. (74) Cross quatrefoil. (75) Cross saltier (saltire) or cross of St. Andrew. (76) Cross saltier voided. (77) Cross fimbriated. (78) Cross undée or wavy. (79) Papal cross.



HERALDIC CROSSES
(See descriptions on preceding page)

reminding traders to practice Christian ethics, were a base for proclamations and originally for worship. The churchyard cross, perhaps at first a gathering place for prayer, received on Palm Sunday the pyx (box) containing the sacred Host.

Heraldic Crosses.—The cross is by no means limited to religious use; most variants are heraldic devices with no ecclesiastical significance. Cross forms are to be found on flags and ensigns and in wondrous variety in heraldry. The cross was one of the most common ordinaries (conventional figures), its use prompted primarily by the Crusades and pilgrimages to the Holy Land. Many forms served as insignia for military and civil orders, as the Cross of St. James and the Maltese cross, the emblem of the Knights



1. Latin cross. 2. Patriarchal cross. 3. Papal cross.
4. Eastern (Russian) crosses. 5. Cross of Lorraine.
6. Calvary (graded) cross. 7. Celtic cross. 8. Cross of Triumph.
9. Greek cross. 10, 11. Maltese crosses. 12, 13. Patee crosses. 14. Crux decussata. 15-17. Tau crosses.
18. Constantinian monogram. 19. Monogrammatic cross. 20. Anchor cross. 21. Swastika. 22. Crux ansata.

of St. John of Jerusalem. This cross has also an ecclesiastical meaning as an attribute of St. John the Baptist, the patron saint of the order, and symbolizes regeneration.

The cross has become the distinctive element in Christian religious decoration, as insignia for certain monastic orders, on ecclesiastical objects, in architectural details. Latin and Greek crosses have been the basis of many church plans, the former, for example, for Santa Croce in Gerusalemme in Rome, the latter for the Church of the Holy Apostles in Constantinople. The sign of the cross is an essential part of the liturgy, for benedictions, confirmations, consecrations, in the Holy Communion, and in ordination.

Certain cross forms have specific ecclesiastical uses or meaning. The patriarchal and papal

crosses, carried before the dignitaries concerned, are symbols of authority. Of early use, both were two-barred crosses but later, mainly for heraldic purposes, the papal cross was changed to three bars. A variant of either the Latin or the patriarchal cross, used by the Orthodox Church, is the Eastern (Russian) cross, which has a bar (*suppedaneum*, the footrest) slanting to the right near the foot. The Cross of Lorraine is a two-barred Latin cross, but with the second bar near the base. Its name derives from its adoption by Godfrey de Bouillon, duke of Lorraine, when he was declared by the Crusaders the first Christian king of Jerusalem. The Cross of Calvary or graded cross is a Latin cross mounted on three steps signifying faith, hope, and charity. A cross surmounting an orb, the Cross of Triumph, symbolizes the triumph of the Gospel throughout the world. The Celtic (Irish) cross, also called the Cross of Iona because an ancient example was found on that island, is a Latin cross with a circle, expressive of eternity, at the intersection of the arms.

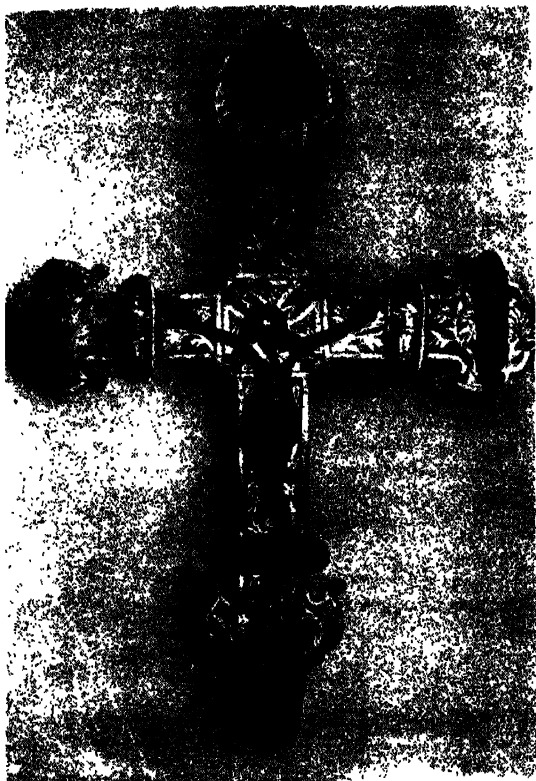
Among ecclesiastical crosses is the pectoral cross (*encolpium*) which was in early Christian times an elaborate ornament, continuing the pre-Christian use of the cross as an amulet. From the 4th century it often was, like the altar cross, a reliquary containing pieces of the True Cross or relics of saints. It was not always a plain cross, but might be a crucifix or bear scenes from the life of Christ. Since the 17th century it has become a liturgical cross worn over the vestment by many clergy. The processional cross (*crux stationalis*) dates from the 4th century when it probably served also as the altar cross. It was used in processions to meet important functionaries and in litanies. In early Christian art Christ and St. Peter frequently carry such a cross of the Latin type. By the 13th century a plain cross was replaced by a crucifix and, being at the head of the procession, the whole symbolized the Christians as followers of Christ.

Legends.—Many traditions and legends have centered around the Cross of Christ. An early belief equated the Cross with the tree of life (Genesis 2:9) and pictorial representations, particularly in the Middle Ages, show the Cross with living foliage or as a tree. In an anonymous Anglo-Saxon poem entitled *Dream of the Rood* (*Vision of the Cross*) the Cross expresses its feelings at Christ's crucifixion. Several lines of this poem are inscribed on the Ruthwell cross. Another legend varying in length and complication—depending upon the narrator—traces the history of the Cross from the seeds of the tree of knowledge which, legend says, Seth planted over Adam's grave.

A 13th century version, in Jacobus de Voragine's *Golden Legend*, carries the story through Moses' legendary "planting" of the rods and the sprouting of Aaron's rod (Numbers 17:1-8), the eventual cutting down of the tree for Solomon's Temple, and its ultimate use as the Cross of Christ. This legend continues with the finding of the Cross by St. Helena, its capture by the Persians, and its subsequent recovery by Heraclius. Toward the end of the 14th century artists took up the theme. Noteworthy are the frescoes in the Church of San Francesco in Arezzo, Italy, painted by Piero della Francesca about 1452-1466 and depicting the story of the Cross as described in Jacobus' version of the legend.

Most feasts of the Cross originated in Jeru-

CROSSES AND CRUCIFIXES



Spanish—processional cross—14th century. Champleve enamel and copper gilt



French—Limoges—12th century. Champleve enamel.

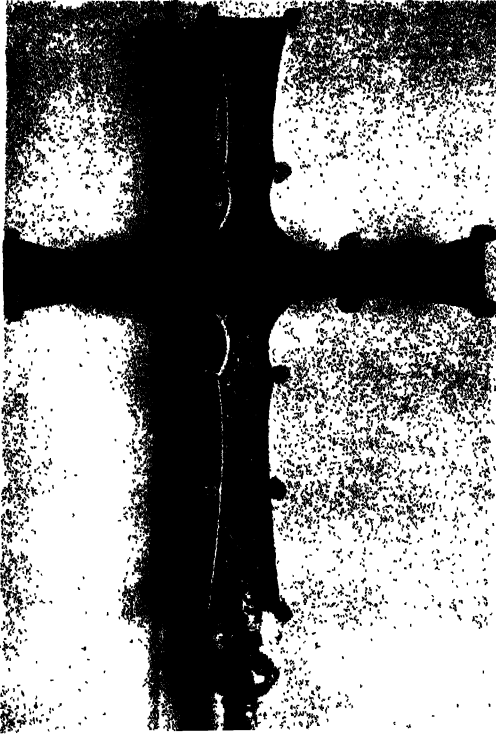


Spanish—12th century. Bronze.



Courtesy of the Metropolitan Museum of Art
French—Limoges—13th century. Gilt, copper and champleve enamel.

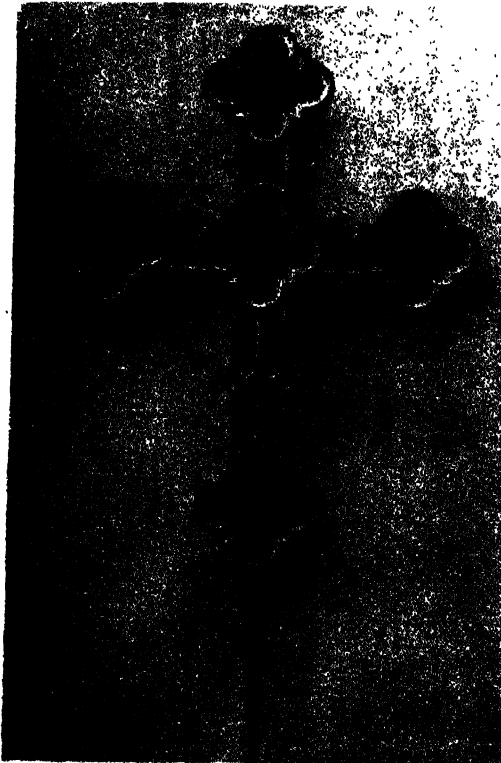
CROSSES AND CRUCIFIXES



Celtic—Cross of Cong—12th century. Oak, plates of copper, covered with gold and silver, set with stones and enamels.



Spanish—architectural cross. Papal badge shown on front, iron



Italian—processional cross—15th century. Silver and translucent enamel.



Celtic—Cross of Clogher—17th century. Oak, plated with bronze, ribs of silver.

Courtesy of The Metropolitan Museum of Art

saalem to commemorate events relating to the True Cross. The Invention of the True Cross, celebrating its discovery, is observed by the Roman Catholic Church on May 3, and on September 14 by the Eastern Church. The Exaltation of the Cross (called Elevation in the East), originating in Rome, is held on September 14 and honors primarily the recovery of the Cross by the emperor Heraclius in 628. The East also celebrates on May 7 the appearance of the Cross in the 4th century to St. Cyril of Jerusalem, and on August 1 the translation of the relics from the palace in Constantinople (now Istanbul) to the Church of Hagia Sophia. The Armenian Church observes only one festival, the *Chatz*, in the autumn. The Adoration of the Cross is observed on Good Friday in both the Roman Catholic and the Eastern churches.

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MARGARET A. ALEXANDER.

CROSSOPTERYGII, krō-sōp-tě-rīj'i-i (New Lat., fr. Gr. meaning fringe + fin), an order of bony fishes, the earliest of which are fossils of the Middle Devonian age, chiefly in Europe, North America, and Greenland. The most important fact regarding the group is that it includes the freshwater fishes which gave rise to the armored amphibia, Stegocephalia, in late Devonian time, and through them, to all succeeding tetrapod vertebrates. The crossopterygians, and also the closely related lungfishes or Dipnoi, are remarkable in having choanae or internal nostrils, and lungs for air breathing, in addition to gills. In view of these facts, Alfred S. Romer has proposed the name Choanichthyes (from Greek meaning funnel + fishes) for a subclass comprising these two orders. A common name for the crossopterygians is lobe-fin fishes, referring to the fact that their paired fins have the form of a projecting lobe, a sort of paddle-like limb containing bones and muscles.

There are two crossopterygian suborders. In one of them, the Rhipidistia (from Greek meaning fan + sail), which became extinct in the Lower Permian, several genera have paired fins in which the bones are strikingly comparable to the three long bones of the tetrapod fore and hind limb (respectively humerus, radius, ulna,

and femur, tibia, fibula); the tetrapod likeness also extends to many other anatomical features. Important Devonian genera are *Osteolepis*, *Eus-thenopteron* and *Sauripterus*.

The second suborder, the Coelacanthini (from Greek meaning hollow spines, referring to fin spines) migrated from fresh water to the sea, and persisted throughout the Mesozoic. They were believed to have become extinct by the end of that era, hence the capture of a five-foot living coelacanth off the South African coast in 1939 was a veritable zoological sensation. It was in general quite similar to certain Mesozoic coelacanths (*Undina* and *Macropoma*) but apparently is a new genus. It was named *Latimeria*. A second coelacanth, of another new genus, was caught by a fisherman near the island of Anjouan in the Comoro group, between Africa and Madagascar, in 1952. It was given the generic name *Malania*. These recent coelacanths are said to lack internal nostrils, possibly a secondary condition related to marine life. See also ICHTHYOLOGY.

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CROSSWORD PUZZLES. The crossword puzzle is a direct descendant of the ancient word square in which the letters spelled the same words horizontally and vertically. The crossword, however, is built on a pattern of black and white squares, with different words interlocking across and down, and with numbered definitions given as clues to the words.

According to *Famous First Facts* (by Joseph Nathan Kane), the first crossword puzzle was put together by Arthur Winn and appeared in the supplement of the New York (Sunday) *World* of Dec. 21, 1913. It remained as a Sunday feature of modest popularity and underwent various improvements in form until the next important date in its history, April 10, 1924, when the first book of crossword puzzles appeared. It was edited by the three New York *World* puzzlers, Margaret Petherbridge (Farrar), Prosper Buranelli, and F. Gregory Hartswick, and was published on the first list of Simon & Schuster, Inc. This touched off what became in 1924-1925 first a nationwide and then a worldwide craze, and thereafter established itself as a permanent pastime in the word-game field.

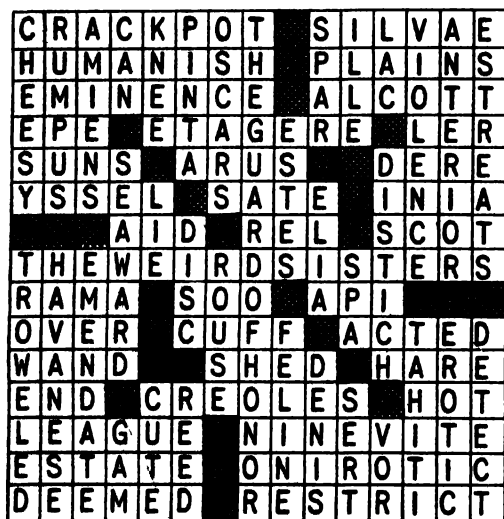
Other newspapers began to print crossword puzzles, and the *World* pioneered in starting a daily series in 1924. The New York *Herald Tribune* soon followed suit. The New York *Times* has had a crossword page in its Sunday magazine since February 1942, and a daily series since September 1950. The crossword puzzle continues as a daily and/or Sunday feature in a high percentage of the world's newspapers.

The British took up the puzzles in 1925, first importing American books but soon developing a style of their own with many more black squares to the pattern and with abstruse definitions. A puzzle constructor who signed himself Torquemada gained a wide following, and in *Punch* a business executive is pictured as requesting his secretary to "look up 'herdic' in the

Oxford English; see if you can find an 11-letter alternative for 'courage' in the thesaurus; work out an anagram for 'orfruw' meaning a narrow trench; and then ring up the Natural History Museum and find out what two-word omnivorous mammal always produces quadruplets of identical sex."

Gradually crosswords were taken up all over the world, and are printed in all languages except those which, like Chinese, do not lend themselves to across-and-down manipulation. *Les Mots Croisés* prove that the French language is well adapted to the word game, and in Canada a bilingual type is popular, with French words reading one way and English words the other, carrying English and French definitions. In Russia the puzzles have been used for propaganda purposes, having specially slanted definitions.

In the United States the original series of puzzle books has been coming out at the rate of two or three a year and has sold over two million copies. In paper covers, many millions more have been sold, and a dozen or more crossword magazines are to be found on the newsstands.



A completed crossword puzzle.

Variations such as topical puzzles based on news words or words from some other category, puzzles for children, diagramless puzzles in which the diagram is reproduced from the numbered definitions, an American version of the British type having puns and anagrams, have become popular. By 1930 the term "crossword puzzle" rated a place in the dictionaries whose use it has so ably boosted.

The rules for crossword construction, as worked out in the United States, are: symmetrical pattern limited to one-sixth black squares; all over interlock, with no segments cut off from the rest; no unkeyed letters, that is, letters in one word only.

The quality of puzzle construction is gauged the low word total in proportion to the size the pattern, and of course by the ingenuity of the word combinations. Fewer and longer words make for more interesting solving. The quality of the definitions is also an important factor. Recent developments in construction allow for more than one word per space, so that full names, book titles, phrases, quotations and parts of them may appear. The crossword is

capable of constant variation; and in addition to pure entertainment, educational and therapeutic values have been claimed for it.

MARGARET FARRAR.

CROTALARIA, kröt-ä-lä'rī-ä, or **RAT-TLEBOX**, is a large genus of some 250 to 300 annual and perennial herbs and shrubs of warm regions, belonging to the pulse or pea family (Leguminosae). The leaves are simple, the flowers often yellow, and the loose seeds rattle in the coriaceous inflated pods (legumes) about two inches long, hence the name. Four species occur in the eastern United States, some like *C. spectabilis* having been introduced from the tropics. Rabbitbells (*C. angulata*) is a perennial found from Virginia to Florida, Louisiana, and tropical America. Some species are cultivated, especially in the South.

CROTALIDAE, krō-täl'i-dē, a family of venomous snakes comprised of the pit vipers. All members of this family have a conspicuous pit on each side of the face between the eye and nostril. These pits, the basis for the name pit viper, are extremely sensitive heat receptors; they enable these snakes to detect the presence of warm-blooded prey. The group is often classified as a subfamily (Crotalinae) of a more inclusive family (Viperidae) in which the true vipers also are placed. Representatives of the group in the Western Hemisphere include the rattlesnakes, water moccasin, copperhead, fer-de-lance, and bushmaster. Pit vipers also occur in Asia, one species ranging as far west as eastern Europe.

CROTHERS, krūth'ērz, **Rachel**, American playwright: b. Bloomington, Ill., Dec. 12, 1878. After graduating from Illinois State Normal School she entered the Wheatcroft School of Acting in New York, where she soon turned from student to instructor and coach. Her first success, *The Three of Us*, produced by John Golden in 1906, was followed by a long series of plays, nearly 30 during her active career, many of them given high critical praise. Outstanding are *A Man's World* (1909); *Once Upon a Time* (1918); *Nice People* (1921); *Let Us Be Gay* (1929); *As Husbands Go* (1931); *When Ladies Meet* (1932); *Susan and God* (1937), considered one of her finest.

In 1939 she received the Chi Omega National Achievement award. She is regarded by many as the leading woman dramatist of her time. Her plays—directed and supervised by herself—deal most often with moral and social questions affecting women, and have been notable for careful construction. She headed and actively participated in war relief work by stage women in both world wars.

CROTHERS, Samuel McChord, American clergyman and essayist: b. Oswego, Ill., June 7, 1857; d. Cambridge, Mass., Nov. 9, 1927. After attending Wittenberg College, Ohio, and the College of New Jersey (now Princeton), he graduated from Union Theological Seminary, New York, in 1877. For several years he was a Presbyterian minister, serving in Nevada and California and becoming known as "bishop of the Northwest." Then his growing liberal views led him to Unitarianism, and after attending Harvard Divinity School he was ordained a Unitar-

ian minister in 1882. He was called to Brattleboro, Vt., then to St. Paul, Minn., and finally to Cambridge, Mass. (1894), where as pastor of the historic First Parish he did his most enduring work. Crothers was one of the preachers to Harvard.

Though an able pulpit speaker, particularly forceful on personal liberty and the freedom of the soul, Crothers became generally known for his long series of familiar essays written in an easy, semiserious style charged with whimsical humor. *The Gentle Reader* (1903) won him a wide audience; others include *The Understanding Heart* (1903); *Among Friends* (1910); *Humanly Speaking* (1912); *The Dame School of Experience* (1919); *The Cheerful Giver* (1923); and appreciations of Charles Dickens, Oliver Wendell Holmes, and Ralph Waldo Emerson.

CROTON, krō't'n, is a genus of more than 600 species of frequently strong scented, hairy or glandular trees, shrubs, or rarely herbs, mostly found in the warm parts of the world, belonging to the spurge family (Euphorbiaceae). The Greek name *kroton* (tick) is based on the resemblance of the seeds to ticks. Several species are found in the southern and eastern United States such as hogwort or woolly croton (*C. capitatus*), prairie-tea (*C. monanthogynus*), and skunkweed (*C. texensis*). Hogwort and skunkweed are poisonous if eaten by cattle with hay. The poisonous principle may be the same as that found in other species of the genus. Economically important species are *C. cascarilla* and *C. eluteria* of the Bahamas which yield cascarilla bark used as a tonic, *C. tiglium* of India and Ceylon, source of croton oil, *C. lacciferus* which yields a lac resin for varnish-making.

Croton oil, obtained from the seeds of *C. tiglium*, is a yellow or brownish, slightly viscid, and somewhat fluorescent liquid with a faint, characteristic odor, containing oleic and other acids and a mixture of various substances. If applied externally, croton oil may cause blistering and irritation of the skin. Being the most drastic purgative, croton oil no longer has a place in modern medicine. In addition to oil, the seeds contain a toxic mixture of globulin and albumose, known as crotin, which attacks blood corpuscles and the central nervous system.

The crotons grown in gardens and greenhouses for their ornamental foliage belong for most part to *Codiaeum variegatum*, native in Malaya and the Pacific Islands like the five other species of this genus which is also a member of the same family.

CROTON AQUEDUCT AND CROTON DAM. See **AQUEDUCTS**.

CROTON OIL. See **CROTON**.

CROTON-ON-HUDSON, village, New York, in Westchester County, is situated near the mouth of the Croton River, on the east bank of the Hudson, 34 miles north of New York City, on the New York Central Railroad. It is a residential community, but has railroad maintenance shops and manufactures of handbags and perfume. The village was settled by the Dutch in 1609, incorporated in 1898, and in 1930 was enlarged by the addition of Harmon. Pop. (1950) 4,837.

CROTON RIVER, river in New York which rises in Dutchess County, runs south through Westchester County, emptying into the Hudson at Croton Point, 32 miles north of New York City. Its length is nearly 60 miles. Since 1842 the Croton watershed, covering an area of about 362 square miles above Croton Dam, has supplied New York City (that is, the present Borough of Manhattan) with water through Croton Aqueduct. Reservoirs along the course of the river include Boyd's Corners, Middle Branch, East Branch, Titicus, Carmel, Cross River, Bog Brook, Amawalk, New Croton, and Croton Falls.

CROTONE, krō-tō'nā (formerly Cotrone, kō-trō'nā; ancient CROTONA or CROTON), commune, Italy, in Catanzaro Province, Calabria, on the Gulf of Taranto. It has a good harbor and is a commercial and industrial center for a region producing grains, olive oil, dairy products, livestock, and sulphur. Its important chemical and metallurgical works are run by power obtained from a large hydroelectric plant in the Silagian Mountains (Ital. La Sila). The city is also a bishopric, with a cathedral, castle, and museum of antiquities.

The ancient town was founded by the Achaeans as a Greek colony about 710 B.C., and became famous for its athletes, among them the celebrated Milo (6th century B.C.), and as the city where Pythagoras taught between 540 and 530 B.C. Livy gives the circumference of the ancient city as 12 miles. In 510 B.C. Crotona defeated the neighboring Sybarites in battle and destroyed their city, but in 480 B.C. its own forces were defeated by the Locrians and Phlegians. It was later captured by Dionysius the Elder, of Syracuse, and in 299 B.C. was taken by Agathocles. In 277 B.C. it came under Roman rule, but after the battle of Cannae revolted from Rome and for three years was the winter headquarters of Hannibal. During the invasion of Italy in World War II the town was bombed by the Allies, and was taken by British troops in September 1943. Pop. (1951) 31,895.

CROTOPHAGA, krō-tōf'ā-gā, a genus of birds, the typical one of the subfamily Crotophaginae. The bill is greatly compressed and the ridge of the upper mandible keeled. The species are found in South America. *C. ani* is the ani, the razor-billed blackbird of Jamaica, also the savanna blackbird and the great blackbird. It feeds on small lizards, insects, and seeds. See also **ANI**.

CROTUS RUBIANUS, krō'tūs rōō-bī-ā'nūs (real name Johannes Jäger, yā'gēr), German humanist: b. Dornheim, Thuringia, about 1480; d. about 1539. He was educated at Erfurt, and from 1510 to 1515 was head of the monastery school at Fulda. In 1515 he contributed several satirical letters on scholasticism and monasticism to the first part of *Epistolae Obscurorum Virorum*. He was in Italy from 1517 to 1520, visiting Rome and Bologna, and in 1521 became rector of the University of Erfurt where he entertained Martin Luther. From 1524-1530 he lived at Königsberg as adviser to Duke Albert of Prussia. He had accepted the principles of the Reformation, but about 1530 reentered the Roman Catholic Church and became a canon at Halle. His *Apologia* was published at Leipzig in 1531.

CROUCH, Frederick Nicholls, English musician: b. London, Eng., July 31, 1808; d. Portland, Me., Aug. 18, 1896. He studied music with his father, an eminent violincellist, with his grandfather, a well-known organist, and at the Royal Academy of Music. He played in the orchestra of Drury Lane Theatre, sang in the choirs of Westminster Abbey and St. Paul's, and later (until 1832) played the violoncello in Queen Adelaide's private band. He composed numerous songs, including the famous *Kathleen Mavourneen* (published 1839-1840), the words of which were by a little-known Irish poet Mrs. Louisa Macartney Crawford (1790-1858). He also composed two operas, *Sir Roger de Coverley* and *The Fifth of November*. In 1849 he visited New York and remained as violincellist in the orchestra of the Astor Place Opera House. He taught music in Portland, Me., 1850-1856, and subsequently in Washington, D.C., and Richmond, Va. During the Civil War he served as trumpeter with the Confederate Army, and after the war settled in Baltimore as a teacher of singing. He is said to have invented the zincography process of printing music.

CROUP, krōōp, catarrhal laryngitis, is a condition of the larynx seen in children. This is a recurring laryngitis characterized by hoarseness, a harsh metallic or "brassy" cough and, if there is much difficulty in respiration, by a crowing sound on inspiration. Croup was formerly associated with diphtheritic membranous laryngitis and this type was referred to as diphtheritic croup. It is no longer so denoted. Croup is seen oftenest during the winter months and usually comes on at night. The cause is a coryza especially among those who have enlarged tonsils or adenoid growths. Intestinal disturbance is commonly regarded as a contributing factor. An attack of croup comes on suddenly, usually with some premonitory hoarse breathing, and the initial attack is frequently repeated on succeeding nights. The symptoms resemble those of strangulation and cause great anxiety to the parents of the affected child, although ordinary uncomplicated croup seldom or never results fatally.

The treatment advised is immediate immersion in a warm bath, the use of benzoin inhalations, and the administration of a mild opiate such as paregoric. Wine of ipecac is also recommended since prompt emesis will clear out mucus in the air passages. After relief is obtained a laxative is generally given. A period of several days of bed rest is advisable and protection against chilling is essential. If adenoids are present, their removal is indicated. The so-called "croup kettle," a small boiler with an inhalation tube attached, is useful in recurring croup. Water and medicaments are placed in the kettle and the steam is inhaled or allowed to humidify air surrounding the patient.

A type of croup is sometimes seen in which there is extreme spasm of the larynx. This is known as spasmodic laryngitis or *laryngismus stridulus*. The disorder is observed generally in children under the age of 18 months. Closure of the glottis during the paroxysm results in severe dyspnea. Spasmodic laryngitis is probably a nervous affection and has been reported related to tetany (q.v.). Respiration may cease for a considerable period, the face becoming congested to an alarming degree. After what seems a dangerous interval the spasm relaxes and air rushes

into the lungs accompanied by a high-pitched sound. In very young infants convulsions may be present. In every case of croup, whatever the cause, it is well to keep the child in a room with an even temperature, neither excessively warm nor unduly cold.

Croup due to influenza may be extremely serious. This type is often a fulminating infection due to *Hemophilus influenzae*. It is attended by high fever and acute laryngitis with respiratory obstruction. A few hours after the attack the child appears acutely ill, with labored breathing and deep cyanosis. Without specific therapy the outlook for recovery is poor and in a large proportion of cases death will occur in from 2 to 4 days. Where specific therapy is begun early with administration of sulfonamides, streptomycin, or occasionally, specific rabbit serum the prospect for recovery is said to be good.

The differential diagnosis between simple croup, laryngeal infection by the streptococcus, and laryngeal diphtheria is most important. Croup comes on at night, shows improvement in the morning and is generally without fever. Moreover examination of throat reveals no membrane formation. In other types, due to the streptococcus or *Hemophilus*, there is high fever, redness, and swelling of the fauces and air passages and a rise in blood leucocyte count. In laryngeal diphtheria the temperature is generally not over 102°F., hoarseness is prominent and increases, a membrane develops in the larynx, there is great respiratory embarrassment, and the pulse is rapid and often feeble. In every case of severe involvement of the larynx throat cultures should be made without delay in order to reveal the specific organism present and to initiate specific therapy if this is indicated.

HAROLD W. JONES, M.D.

CROUSE, krouse, Russel, American writer: b. Findlay, Ohio, Feb. 20, 1893. After attending common school and high school he began newspaper work in 1910, first as a reporter for the Cincinnati *Commercial-Tribune*, then with the Kansas City (Mo.) *Star*, the Cincinnati *Post*, and —following service in the navy in World War I— with the New York *Globe*, the *Evening Mail*, and the *Evening Post* (as columnist, 1925-1931). His books include *Mr. Currier and Mr. Ives* (1930), *It Seems Like Yesterday* (1931), *Murder Won't Out* and *The American Keepsake* (1932). With Howard Lindsay he was coauthor (1939) of the dramatization of Clarence Day's book *Life With Father*, of the 1946 Pulitzer Drama Award play *State of the Union*, and of *Life With Mother* (1948), the musical success *Call Me Madam* (1950, music by Irving Berlin), and *The Prescott Proposals* (1953).

CROUTER, Albert Louis Edgerton, American educator: b. Belleville, Ontario, Canada, Sept. 15, 1846; d. Philadelphia, Pa., June 26, 1925. He was educated at public and private schools in Belleville and later at Franklin Institute and the University of Pennsylvania. Moving to Kansas at the age of 20, he taught briefly in an Indian school at Shawneetown. There he met Thomas Burnside, superintendent of the Kansas School for the Deaf at Olathe, and became a teacher in that institution. Education of the deaf became his life work. He was especially interested in the oral method of instruction. In 1884 he became principal of the Pennsylvania Institution for the

Deaf at Philadelphia, and in 1892 supervised its removal to Mount Airy where during the 58 years of his administration it gained a world-wide reputation. One of the founders of the American Association to Promote the Teaching of Speech to the Deaf, he succeeded Alexander Graham Bell as its president in 1904, and in 1907 represented the United States at the International Conference of Instructors of the Deaf held at Edinburgh, Scotland.

CROW, krō, a name applied to many of the approximately 25 species of the genus *Corvus*, a group of which a typical member is the raven and which includes also the rook (qq.v.). The term "crow family" is sometimes used for the entire family Corvidae which contains, in addition to the genus *Corvus*, the jays, magpies, nutcrackers, and a few others. Though technically songbirds, crows do not have a musical song; their discordant cawing is well known. Crows average about a foot and a half long and have a wingspread of from two to four and one-half feet, the raven being the largest and the most powerful of all perching birds. Most crows are entirely black, but a few Old World ones, such as the hooded crow, have some white in the plumage.

Crows are strong-legged, robust birds of omnivorous feeding habits. The bulk of their diet consists of seeds and harmful insects but they supplement this with the eggs and young of other birds. In the winter, especially, they visit the shore to search for dead fish or other edible matter. Offal is also taken, particularly by the carrion crow (*C. corone*) of Europe. At times, crows are destructive to corn, which they often remove from the ground as soon as it is planted. Although they are shot and poisoned at every opportunity by many farmers and sportsmen, crows, wary and cunning by nature, survive in large numbers. Many authorities consider crows and ravens to be the most highly evolved and intelligent of all birds.

The American crow (*C. brachyrhynchos*) is found over most of the United States and southern Canada. Each pair builds a strong nest of twigs, lined with grass and strips of soft bark and situated in a fork of a tree, some 10 to 40 feet above the ground. The three to six eggs are bluish green, heavily marked with brown. Young crows make amusing pets and can sometimes be taught to imitate a few words of human speech. The belief that splitting the tongue improves this speaking ability is entirely fallacious. In winter the American crow assembles at night in huge roosts containing thousands of birds. By day the crows scatter far and wide to search for food. Only in very cold regions such as the plains of western Canada does this crow migrate south in winter. The fish crow (*C. ossifragus*) of North America is a closely similar but somewhat smaller species which frequents the eastern seaboard and to a certain extent inland river valleys.

CROWBERRY (*Empetrum*), the largest of three genera belonging to the small crowberry family (Empetraceae), includes several species of low, shrubby, heathlike evergreens with small, narrow, stiff, and revolute leaves, apetalous flowers, and berry-like, edible fruits (drupes). The black crowberry (*E. nigrum*) occurs from the Arctic zone to New England, New York, Minnesota, and northern California as well as in Eurasia, and has a dark-fruited and a white-fruited

form. The purple crowberry (*E. atropurpureum*) with red or purple-black fruits is found from Labrador to New England. Its counterpart, *E. rubrum*, occurs in Patagonia, southern Chile, and some antarctic islands. The third species found in eastern North America is the rockberry, *E. Eamesii*, with pink or light red fruits. Members of this family are difficult to cultivate and have little economic value.

CROWDER, krou'dēr, **Enoch Herbert**, American soldier: b. Edinburg, Mo., April 11, 1859; d. Washington, D.C., May 7, 1932. Graduating from the United States Military Academy at West Point in 1881, he was commissioned a 2d lieutenant in the 8th Cavalry at Fort Brown, Texas, studied law, and in 1884 was licensed as an attorney in Hidalgo County, Texas. The following year he was detailed to the University of Missouri at Columbia as professor of military science and tactics and did much to advance military training for students. While there, he took a course in law and received the degree LL.B. in 1886. In 1891 he was assigned as captain and acting judge advocate to the Department of the Platte at Omaha, Neb., and in 1895 was made a major in the Department of the Judge Advocate General in which he served until he retired from the army in 1923.

During the Spanish-American War, Major Crowder served as judge advocate in the Philippines; in 1903 was promoted colonel and appointed chief of the 1st Division of the first General Staff of the army. In 1904-1905, during the Russo-Japanese War, he served as American military observer with the Japanese Army in Manchuria. He was in Cuba from 1906 to 1909 as a member of the provisional governor's staff and headed the commission for drafting the basic laws of the republic. In February 1911 he was made judge advocate general of the army with the rank of brigadier general. Early in 1917, at the request of the secretary of war, he drafted the selective service bill which Congress enacted into law on May 18. After serving as United States ambassador to Cuba, 1923-1927, he retired from public service and opened law offices in Chicago, practicing until ill health compelled his retirement in 1931. His grave is in Arlington National Cemetery.

CROWE, Catherine (nee STEVENS), English novelist: b. Borough Green, Kent, England, about 1800; d. ? Edinburgh, Scotland, 1876. She was deeply interested in spiritualism and is best known for her *Night Side of Nature* (1848), considered one of the best collections of supernatural stories in English. She abridged *Uncle Tom's Cabin* for juvenile readers; wrote several novels, the most successful being *Susan Hopley* (1841) and *Story of Lilly Dawson* (1847); and was the author of the treatise *Spiritualism and the Age We Live In* (1859).

CROWE, Eyre Evans, English journalist and historian: b. Redbridge, Southampton, England, March 20, 1799; d. London, Feb. 25, 1868. He attended Trinity College, Dublin, Ireland, but left before graduating to enter journalism in London. He published several novels and historical works, including a 5-volume *History of France* (1858-1868), and was editor of the *Daily News*, 1849-1851.

His elder son, EYRE CROWE (b. London, Oct. 3,

1824; d. there, Dec. 12, 1910), studied painting with Paul Delaroche in Paris, was elected an associate of the Royal Academy in 1876 and full member in 1888. Two of the best known of his many paintings are *Brick Court, Middle Temple* (1863), and *The Queen of the May* (1879). In 1852-1853 he visited the United States with William Makepeace Thackeray, acting as his secretary, and later published *With Thackeray in America* (1893), and *Haunts and Homes of Thackeray* (1897).

SIR JOSEPH ARCHER CROWE (b. London, Oct. 20, 1825; d. Baden, Germany, Sept. 6, 1896), younger son of Eyre Evans Crowe, was a special war correspondent in the Crimea and in India, and director of the art school at Bombay in 1857-1859. From 1860 to 1882 he held various European posts in the British diplomatic service, wrote extensively on art subjects, and collaborated with the Italian critic Giovanni Battista Cavalcaselle on *Early Flemish Painters* (1857) and the noteworthy 5-volume *History of Painting in Italy* (1864-1871). He published his *Reminiscences* in 1895.

His son, EYRE ALEXANDER BARBY WICHART CROWE (b. Leipzig, Germany, July 30, 1864; d. Swanage, England, April 28, 1925), was educated at Düsseldorf, Berlin, and Paris, and entered the British Foreign Office in 1885, becoming counsellor of embassy in 1907 and assistant under-secretary of state in 1912. Prior to World War I he devised the plan for seizing German shipping in British ports which was put into operation when war broke out, and was minister plenipotentiary at the Paris Peace Conference. In 1920 he became permanent under-secretary for foreign affairs.

CROWE, William, English clergyman and poet: b. Midgham, Berkshire, England, where he was baptized Oct. 13, 1745; d. Bath, Feb. 9, 1829. He was educated at Winchester College and at New College, Oxford. Though he published sermons, orations, and other works, he was best known for his poem *Lewesdon Hill* (1788), which was highly regarded by William Wordsworth and other poets of his day. He was the author of *A Treatise on English Versification* (1827).

CROWELL, krō'el, Edward Payson, American educator: b. Essex, Mass., Sept. 7, 1830; d. Amherst, Mass., 1911. Educated at Amherst College and at Andover Theological Seminary, he was successively instructor in German at Amherst, professor of Latin language and literature, and, 1880-1894, dean. He edited many of the Latin classics and was author of *A Clue to the Prose Writings of the Silver Age* (1897), among other works.

CROWELL, Grace (nee NOLL), American poet: b. Inland, Iowa, Oct. 31, 1877. She was educated at German English College, Wilton, Iowa, and in 1901 married Norman H. Crowell of Dallas, Texas. A writer of verse since 1906 and winner of numerous poetry prizes, she was poet laureate of Texas, 1935-1937, and in 1938 was named by American publishers as one of the 10 outstanding women of the year. Her most recent works include *Apples of Gold* and *A Child Kneels to Pray* (1950); *Meditations* (1951); *Brightest Harvest* and *Little Boy Down the Lane* (1952); *Moments of Devotion* (1953).

CROWELL, John Franklin, American economist: b. York, Pa., Nov. 1, 1857; d. East Orange, N. J., Aug. 6, 1931. He was educated at Yale and Columbia universities, and studied also at the University of Berlin, Germany. After several years of college teaching, he became associated with the United States Treasury Department as an expert of the Industrial Commission, and also as an expert on internal commerce for the Bureau of Statistics. He was an editorial writer for the *Wall Street Journal*, 1906-1915; president of the American Civic Alliance, 1910-1911; executive officer of the New York State Chamber of Commerce, 1915-1917; and director of the World Market Institute, New York City, 1919-1921. Crowell published numerous works on economics and related subjects, among them: *Taxation in the American Colonies* (1893); *The Logical Process of Social Development* (1898); *Internal Commerce of the United States* (1902); *Trusts and Competition* (1915); *Social Insurance with Special Reference to Compulsory Health Insurance* (1917); and *Government War Contracts* (1920). He also wrote on individual aspects of the United States economy, including farm products, iron and steel trade, lumber trade, and shipbuilding.

CROWELL, Luther Childs, American inventor: b. West Dennis, Mass., Sept. 7, 1840; d. there, Sept. 16, 1903. After attending an academy and also studying medicine for a year he served four years in the merchant marine, then went to Boston to develop an aerial machine which he had invented and for which he obtained a patent on June 3, 1862. Financial difficulties put a stop to this project, but while working on it he invented a machine for making paper bags which he patented in 1867. Five years later he invented and patented the square-bottomed paper bag and the machine for making it, and soon afterward the side-seam paper bag.

Crowell sold partial rights in his bag patents to a rival company, which he had sued for infringement of patent, and turned his attention to devising improvements in printing machinery. In 1873 he patented a rotary sheet-delivery and folding machine which was first used two years later in the new presses of the *Boston Herald*. R. Hoe & Company invited him to join them and he entered their employ in 1879, transferring his residence to New York City, and remained with them until his death. His inventions contributed substantially to advancements in printing, and he received more than 280 United States patents on printing machinery alone. He was a member of the American Society of Mechanical Engineers and of Franklin Institute.

CROWFIELD, Christopher, a pseudonym sometimes used by Harriet Beecher Stowe.

CROWFOOT. See BUTTERCUP.

CROWLAND or **CROYLAND**, town, England, in Lincolnshire, 8 miles northeast of Peterborough, on the Welland River. Its four principal streets intersect at a 14th century triangular bridge spanning streams now covered. On it is an early stone effigy, possibly that of the Saviour, which once crowned the west façade of ancient Crowland Abbey. The only edifice of note is the ruined abbey, which may have been built as early as 716

and rebuilt about 1100, the north aisle of which forms the parish church. Ingulf (d. 1109), to whom a history of the abbey of Crowland, first published at London in 1596, afterward at Oxford in 1684, has erroneously been attributed, was abbot of Crowland from 1075 until his death. Pop. (1951) 2,809.

CROWLEY, krō'li, **Robert**, English printer and social reformer: b. Gloucestershire 1518?; d. London, June 18, 1588. He received his B.A. from Magdalen College, Oxford, in 1542 and proceeded to set up his printing office at Ely Rents, Holborn. Although he printed many of his own works (some of them, such as *Way To Wealth*, 1550, and *Pleasure and Pain*, 1551, attacking the hierarchy of the richer classes), he is best remembered for his three impressions of William Langland's *Vision of Piers Plowman* (1550) and for his printing of Welsh books, many of them for the first time. One of his most notable original works was the continuation of Thomas Languat and Thomas Cooper's *Epitome of Chronicles* (1559).

As a deacon and minister, he manifested strong puritan tendencies, living in exile during Queen Mary's reign and being imprisoned in 1566 during Queen Elizabeth's reign because he refused to use any of "the conjuring garments of popery" during his ministry. He was, however, released and continued as a minister and a printer.

CROWLEY, krou'li, city, Louisiana, capital of Acadia Parish, altitude 29 feet, on the Southern Pacific and Missouri Pacific railroads, 98 miles south of Baton Rouge. It is the center of a rice district, and nearby are oil and natural gas wells. Rice-milling is the principal industry, and burlap bags, concrete blocks, and machine-shop products are also manufactured. A rice-growing experiment station here is under state and federal control. In November an annual National Rice Festival is held.

First known as Houstch, it was settled by Acadians in 1866 and was incorporated in 1889. It is governed by a mayor and council. Pop. (1950) 12,784.

CROWN, kroun, an official or symbolical ornament worn on the head, now the symbol of royalty. At first it had no regal significance and was nothing more than a garland of leaves or flowers bestowed on athletes. Later it was made of gold and bestowed on citizens deserving well of their country. In the Middle Ages the crown became exclusively appropriated to the royal and imperial dignity. For further information on regal crowns see **CROWNS** and **CORONETS**.

The term crown is also used figuratively for the royal power, in contradistinction either to the person of the monarch or to the body of the nation, with its representatives, interests, and powers.

In architecture, crown denotes the uppermost member of a cornice, usually called the corona (q.v.). It is also a sort of ornamental structure surmounting a tower and formed by flying buttresses meeting together at top.

In numismatics, the crown is an English coin worth five shillings, or about \$70. It was first minted in gold in 1526 in imitation of the French "Crown of the Sun," but was eventually struck mostly in silver to give England the equivalent of the German taler. The minting of crowns was

stopped from 1902 until 1927 and then continued until 1937 when it again stopped. Silver crowns were struck for the Festival of Britain (1951) and a small amount have been minted each succeeding year.

CROWN COLONIES. The name commonly given to the British dependencies whose government is controlled by the crown (in reality, the home government). A special department of the Colonial Office in London deals with the administrative and political work of the crown colonies and protectorates. The government of most of the colonies is administered mainly by natives and the crown or home government maintains a minimum of control. Typical crown colonies are those of Gibraltar and Cyprus.

CROWN GALL, a disease of many fruit and forest trees usually caused by *Phytophthora tumifaciens*, which obtains entrance usually at the juncture of the roots and the trunk (the crown), but sometimes appears upon the roots. In young trees the galls are often half an inch in diameter, colored like the roots or darker, soft and composed of apparently unorganized tissue, but in old trees they frequently show concentric rings and may become several inches in diameter. In Europe, America, and New Zealand, where this disease is known, considerable damage has been reported, even whole orchards being destroyed by the fungus. The only remedy thought to be of service is the annual removal of the galls and the covering of the wounds with thickened Bordeaux mixture.

CROWN GLASS, a very hard and clear glass, made almost entirely of sand and alkali and a little lime, without lead or any metallic oxide except a very small quantity of manganese, and sometimes of cobalt. The original balloon is flattened, crown-shaped. A steel rod tipped with molten glass is now attached opposite to the blow-pipe which in turn is removed. By rapidly revolving the rod on a horizontal axis opposite the large opening of the glass furnace, the mass of glass softens and spreads out into a disc, thick at the center and thinning toward the edges. The limit of the diameter of these discs is 50 inches. Crown glass is used in connection with flint glass for optical instruments, in order to destroy the disagreeable effect of the aberration of colors. This important discovery by John Dollond, who turned it to admirable account in the achromatic telescope, was carried to the highest perfection by Baron Karl von Reichenbach. This glass is much used for windows, especially for art work, where its peculiarly brilliant surface makes it most acceptable. See also **GLASS**, **VARIETIES OF**.

CROWN LANDS, territories in the British Isles formerly the private property of the sovereign. Since George III, however, every British monarch has on accession surrendered the crown lands to be disposed of by Parliament. The administration of these lands is in the hands of the commissioner of crown lands, and the income from them, like the other revenues of the state, is now devoted to the public service. The produce in 1950 amounted to £2,338,968 of which sum £655,610 was paid into the Exchequer. Before the Norman conquest (1066) all the so-called folk land gradually became *terra regis* or king's land. The confiscations of Wil-

liam the Conqueror greatly increased these terrains, but their redistribution among the king's followers so reduced them again that an Act of Resumption was passed under Henry III, and during the reign of Edward II an act was in force prohibiting the alienation of crown lands. The Wars of the Roses and the confiscations of Henry VIII enlarged the possessions by forfeiture and seizure, but the necessities of James I and Charles I compelled the disposal of the whole estates. These were partially recovered at the Restoration by the sales being declared void. An important constitutional effect was produced by the wholesale granting away of the crown lands; being thus deprived of a private income, the monarch had perforce to apply to Parliament and the nation for his income, which was not infrequently granted only on condition of good government. The extravagance of William III led to an act being passed in the reign of Queen Anne (1702-1714) by which further alienation was greatly checked, but in 1800 the act was declared not to apply to the private property of the sovereign acquired by purchase or inheritance from any person other than a sovereign of England. In 1910 the civil list of the king was fixed (after the usual surrender of hereditary revenues, i.e., the crown lands) at \$2,350,000.

CROWN POINT, city, Indiana, Lake County seat; altitude 709 feet; on the Erie and the Pennsylvania railroads; 36 miles southeast of Chicago. The surrounding area is predominantly agricultural; the city's principal industry is the making of agricultural implements. Crown Point has a public library. Settlement was made in 1834; a monument honors the founder, Solon Robinson, writer and editor. Government is administered by mayor and council. Pop. (1930) 4,046; (1940) 4,643; (1950) 6,500.

CROWN POINT, town, N. Y., located in Essex County; altitude 126 feet; on the west shore of the southern end of Lake Champlain; 109 miles north of Albany; served by the Delaware and Hudson Railroad; now primarily a summer resort with boating, bathing, and fishing facilities, is noted for its scenic beauty and for its history. During the later part of the 19th century it was the center of an extensive iron mining region. In the Crown Point Reservation, 113 acres in the Adirondack Forest Preserve, on N. Y. State Highway 8, is the Champlain Memorial Building built in 1909 by New York and Vermont to honor the memory of Samuel de Champlain (q.v.) discoverer of Lake Champlain, containing a Rodin bas relief of *La France* which was presented to the United States by the people of France in 1912. Here is Lake Champlain Bridge, also built by the two states; and the remains of Fort St. Frédéric, built in 1731 by the French who planned to make it the capital of the projected southern territory, and Fort Crown Point (formerly Fort Amherst). Here, in 1609, Champlain fought and defeated the Iroquois. Later, in 1714, Crown Point became an important English trading station named *Pointe à la Chevelure* (Scalping Point) by the French. In 1755, in the final phase of the contest between the French and the British in America, Sir William Johnson (q.v.) commanded an expedition against Forts St. Frédéric and Crown Point. This got no farther than Fort Edward and ended in

the bloody drawn Battle of Lake George (q.v.). In 1756 the French built Fort Ticonderoga, farther up the lake on the isthmus between Lake Champlain and Lake George. This made Crown Point a second instead of a first line of defense, but the two forts remained the chief French frontier posts throughout the war. In 1757 the forts were attacked by Maj. Robert Rogers' rangers (q.v.) and numerous raiding parties. General James Abercrombie (q.v.), led a British army against the forts, but he was repulsed with heavy losses at the Battle of Ticonderoga July 8, 1758 and forced to retreat. He was superseded by Jeffrey Amherst (q.v.) who, in 1759, while Gen. James Wolfe was taking Quebec, compelled the French to abandon Ticonderoga, and captured Crown Point. Both forts were kept up by the British and at the outbreak of the Revolutionary War were a part of the objective of the Colonial forces to open the route to Canada. In May, 1775, while Ethan Allen took Ticonderoga, Seth Warner (q.v.), captured Crown Point with 113 cannon and a quantity of ammunition. The British held it again in the move toward Saratoga in 1777, but thereafter the fort was no longer of any consequence. Pop. (1940) 1661; (1950 est.) 2,500.

CROWNINSHIELD, Arent Schuyler, American naval officer; b. Seneca Falls, N. Y., March 14, 1843; d. Mt. Desert, Me., May 27, 1908. He was graduated at the United States Naval Academy in 1863, and participated in both attacks on Fort Fisher in the Civil War. Later he rose to the rank of captain. During the war with Spain he was a member of the Board of Strategy. In 1900 he was chief of the Bureau of Navigation, with the rank of rear admiral; commander of the European squadron 1902-1903; a member of the Board of Naval Strategy; retired March 20, 1903.

CROWNINSHIELD, Frederic, American artist; b. Boston, Mass., Nov. 27, 1845; d. Capri, Sept. 13, 1918. Graduated at Harvard 1866; spent 11 years in Europe studying art under Thomas C. Rowbotham, Thomas Couture and Alexandre Cabanel, his first exhibited work appearing in the Paris Salon of 1878. He was instructor in the Boston Museum of Fine Arts 1879-1885, after which he removed to New York, where he was president of the Fine Arts Federation from 1900 to 1909. From 1909 to 1911 he was director of the American Academy in Rome. He was a member of the National Society of Mural Painters. He devoted himself largely to mural painting and stained glass work. His water colors are greatly admired and sought for by collectors. He published *Mural Painting* (1887); *Pictoris Carmina, a Painter's Songs* illustrated by himself (1900); *A Painter's Moods* (1903); *Tales in Metre* (1903); *Under the Laurel* (1907); *Villa Mirafiore* (1912).

CROWNS AND CORONETS, two of the types of headdress which symbolize the rank or honor belonging to the wearer. Crowns are generally worn only by rulers, coronets are worn by persons of lesser rank such as the nobility. Throughout history diadems, tiaras, fillets, wreaths, even hats and bonnets have had similar significance. The "open crown" is a headband with decorative projections on the upper rim. "Closed crowns" have arched segments over the

top of the head. A single band arched from the front to the back of the crown appears on the crown of Charlemagne, and a single band arching across the head from side to side is on the crown of the prince of Wales. The most frequent type is that with two bands of metal intersecting in the center beneath an orb, which is a sphere surmounted by a cross, the combination symbolizing Christian sovereignty. The velvet cap lining many crowns does not make them closed crowns.

Pre-Christian Era.—Although the 21st Psalm says "thou testest a crown of pure gold on his head," not all crowns were of metal. The material used for the crowns of ancient Egypt is unknown. The open, Red crown of the lower Nile and the closed, White crown of the upper (southern and upstream) Nile were combined into a single crown about 3200 B.C. when the two kingdoms were united. (Fig. 1).

A bronze coronet which in significance if not in form can properly be called a crown has survived from the Bronze Age, about 1000 B.C. Found in the Hohenzollern Province in the Black Forest region of Germany, and now in the Metropolitan Museum of Art, it is one of the oldest crowns in existence (Fig. 2).

In the Mycenaean and Greek civilizations the gods and goddesses were represented wearing low, open crowns. The Greeks bestowed wreaths of leaves or garlands of flowers on those they wished to honor. The makers and sellers of garlands formed a distinct trade. Wreaths were worn by dinner guests (to ward off drunkenness), by the bride and bridegroom, and, at funerals, by the corpse. The winner at the Olympic games received a wreath of wild olive. Crowns of leaves, whether for military, naval or civil honors were governed by law. When Athens substituted crowns of gold leaves for the olive garland the city bestowed them more freely than before, showing that while the cost increased the symbolic value decreased. The provinces gave golden crowns to victorious generals and many were bestowed on Alexander after he defeated Darius. The tiara of Saitapharnès, a conical, caplike crown of metal has mythological scenes in low relief. It was believed to be a Greek work of the 3d century B.C. until it was exposed as the forgery of a late 19th century Russian goldsmith.

The Romans gave gold crowns with designs of turreted walls or prows of ships for military or naval exploits. They carried the crowns of emperors or victorious generals in front of them in processions, but not even the emperors wore them. The highest honor was the *corona obsidionalis*, originally made of grass plucked on the site and given to the leader who saved a besieged garrison.

Ancient and Medieval.—Byzantine emperors wore either a closed crown or a high pyramidal cap of silk almost covered by pearls and jewels in imitation of the tiara worn by Persian kings. This type with one or two, and later, three bands representing crowns around it became the tiara worn by the popes.

Recessvinto, the 7th century Visigothic king, and members of his family are believed to have given the eight gold crowns dug up near Toledo, Spain, in 1858, to some church. These circular crowns hung by chains from their upper rims are votive crowns. The largest has separate gold letters, enameled red, suspended by chains

from the lower edge which form the words, *Recessvintus Rex Offeret*. These treasures were purchased by the Cluny Museum in Paris, but during World War II the crown of Reccessvinto was given to Spain as a gesture of friendship by the Vichy régime of France.

The Iron Crown of Lombardy received its name from the narrow band of iron on the inside which was long believed to have been made of nails from the True Cross. The six rectangular gold plates on the outside are decorated with repoussé flowerets and with corner designs in blue, white, and translucent green enamels. It is set with cabochon rubies, amethysts, and sapphires. Only six inches in diameter and perfectly round, this is probably a votive crown, possibly Italian work of the 9th century. It was kept in the cathedral at Monza, near Milan, Italy. Napoleon had it carried in a great procession to Milan where he used it when he was crowned king of Italy in 1805. (Fig. 3).

In the Middle Ages there may have been a real crown of iron at Monza. Some emperors of the Holy Roman Empire had three separate coronations: with a silver crown at Aix-la-Chapelle, with an iron crown at Monza, and with a gold crown at Rome. An iron crown was used in the "lay" coronation of Louis the Bavarian in 1328, and later for Charles IV at Monza, and for Charles V at Bologna.

Charlemagne's crown is more properly called the Old German Imperial crown, or the Golden crown, as it was probably made about two hundred years after Charlemagne. It consists of eight gold plaques, semicircular at the top, which are attached to thin iron bands riveted together on the inside. It is octagonal in shape. Four plates with cabochon emeralds and sapphires in filagree settings alternate with plates with designs in enamel. A cross rises above the largest, central section. A single arch springs from behind the cross to the back of the crown. According to an inscription in pearls on the vertical sides of the arch this was added by the German ruler, Conrad III, in the 12th century. The enameled plaques have Latin inscriptions to explain the designs. They represent the Almighty ("Through me kings reign"); Isaiah telling the sick king, Hezekiah, that he will recover and live fifteen more years; David ("The king's strength also loveth judgment"); and Solomon ("fear the Lord and depart from evil"). These figures and inscriptions show the religious significance of crowns in the Christian countries. (Fig. 4).

St. Stephen's crown is venerated in Hungary where during nine hundred years it was used in the coronation of more than fifty kings. No ceremony was considered constitutional without it. Hungarians believe that as long as the crown is safe, Hungary is safe. It is actually two crowns combined to form one. The upper part consisting of two broad straplike arches is what remains of the Latin crown given by Pope Sylvester II to King Stephen about the year 1001 while the lower part, the circlet, is the Greek crown, and was made about seventy-five years later. Both parts are decorated in cloisonné enamel and are made of gold. At the very top is a plaque with a representation of Christ, pierced to fasten a cross, now askew, at the summit of the crown. On each of the four straps forming the arches are two apostles, the other four were undoubtedly there, but were lost

when the lower part of the crown was broken or cut away. When this was made enameling was in its early stages in Italy, and so each of the apostles appears squint-eyed. The lower crown, possibly made in the royal workshops of the Byzantine emperors is only a little later, but the enameling art was more highly developed there. Set between massive jewels, the plaques represent Christ, suitably placed above the circlet in the center front, and below, on either side, the archangels Gabriel and Matthew, beyond them the "warrior saints" Demetrius and George, then the saints Damian and Cosmas, each with his name in blue enamel. Three plaques on the back, inscribed in red, the color of royal signatures in the Byzantine empire, portray the emperor, Michael Dukas VII, with his relative, Constantine, at one side, and Duke Géza I of Hungary at the other. This lower part is known as Michael Dukas's crown because he gave it to Duke Géza. Thus the lower crown symbolized the support the Byzantine emperor gave to a king of Hungary, and the upper crown carried the approval of the pope to an earlier king, St. Stephen. The two crowns were probably combined by King Béla III of Hungary toward the end of the 12th century. Characteristic of Eastern crowns are the short chains, each ending in a trefoil set with polished jewels, which hang from the lower rim, one in back and two at each side.

Hungarian law prohibited the removal of the regalia from the chest in which it was kept, except for coronations, without the consent of the king and Parliament. On the 900th anniversary of St. Stephen's death, in 1938, it was first publicly displayed and scholars had an opportunity to study it closely.

In 1945 the chest in which the regalia had been carefully guarded was delivered by a Hungarian colonel and an escort of twelve soldiers to the United States Seventh Army at Augsburg. When finally opened the crown, scepter, and orb were missing. The colonel admitted he had buried them according to instructions. The next day he had a mud-covered gasoline drum brought from its secret hiding place. When chiseled open, the missing articles were lifted out of three deteriorating leather boxes. When the crown, scepter and orb had been washed and thoroughly dried they were replaced in their rightful box. Later the box was opened and the contents displayed in the presence of army officers and representatives of the press. The box was then locked and sealed with sealing wax bearing the impressions of the dog tags of the Property Control officer. It was taken to Wiesbaden to await its return to Hungary. After 1945 the whereabouts of St. Stephen's crown was kept

secret by the Western powers in order to ensure its safety. (Fig. 5.)

The German Imperial crown also dates from the 11th century. It is formed of eight plaques, semicircular at the top, decorated alternately with a cross in jewels and a heraldic eagle in enamels. The two arches rise to meet under an orb. (Fig. 6.)

Constantine Monomachus and the Empresses Zoë and Theodora are identified from the names accompanying their portraits on seven gold plates decorated in cloisonné enamel. Some archaeologists believe that these, with an eighth plaque now missing, formed a similar crown of the 11th century. Consequently these plaques, kept in the museum in Pest, are sometimes called the crown of Constantine Monomachus.

The crown of Philip II in the cathedral of Namur shows a type worn in the 12th century. Two medieval English crowns are preserved on the Continent. The silver-gilt crown used at the coronation of Richard, brother of Henry III, as king of the Romans in the 13th century, is on the Charlemagne reliquary at Aachen. The other is the bridal coronet worn by Margaret Plantagenet, sister of Edward IV, at her marriage to Charles the Bold, Duke of Burgundy. It has her name inscribed around it: Margarita de York.

The crown of Bohemia was used at the coronation of Charles IV in 1347. (Fig. 7).

The Turkish Vassal crown originally belonged to King Ladislas II of Hungary, and is probably of early Muscovite or Polish workmanship. In 1526 the Turks captured it, hence its name. In 1605 Sultan Ahmed I sent it to István Bocskay, prince of Transylvania, who later gave it to King Matthias. This crown, preserved in Vienna, has a wooden frame covered with silver-gilt plates. It is decorated in niello and set with pearls and precious stones and has an emerald at the top. (Fig. 8).

Modern Crowns.—*Persian.*—A Persian crown of the 17th century is described by Sir John Chardin in his book of travels (1686) as a flat bonnet made of cloth-of-gold with a chimneylike projection sewed onto the top. It was covered with an "embroidery of diamonds" and featherlike ornaments on the rim were set with diamonds, rubies, emeralds, and topazes.

Austrian.—The Austrian Imperial crown, inscribed with the date 1602, is of pure gold set with diamonds. The circlet is banded top and bottom with pearls, the upper rim bears four large fleurs-de-lis alternating with four smaller ones, all set with rubies and pearls. Rising from each side to form a cap is a triangular metal plate with scenes in low relief of the coronation ceremony. These are framed with wide enameled

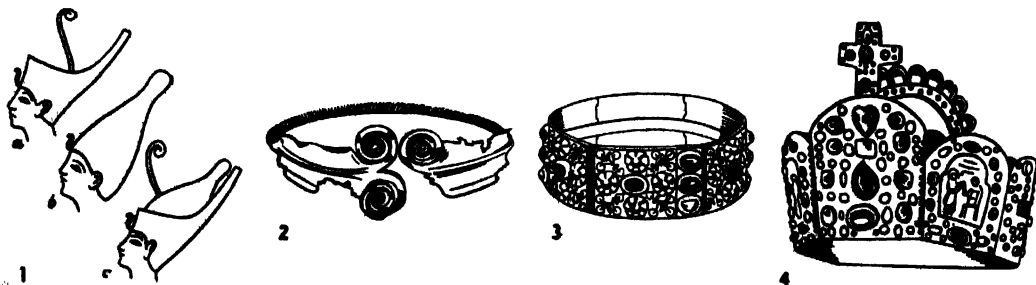


FIG. 1. The three crowns of Egypt: a, the Red; b, the White; c, the combined crown. FIG. 2. Coronet, about 1000 a.c. FIG. 3. Iron crown of Lombardy. FIG. 4. Charlemagne's crown.

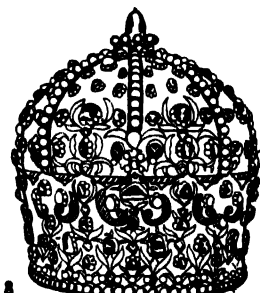
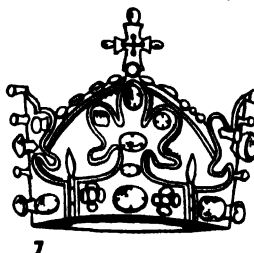
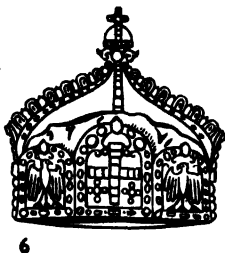
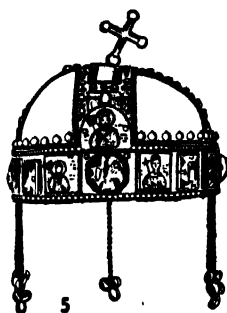


FIG. 5. St. Stephen's crown. FIG. 6. German Imperial crown.

FIG. 7. Bohemian crown.

FIG. 8. Turkish Vassal Crown.

bands around the opening beneath the arch. The single arch has a large sapphire set on the top.

Scottish.—The Scottish crown was originally a gold band with borders of gold wire, set with 22 large stones, with pearls between them. Above the rim are fleurs-de-lis, crosses and pinnacles. The arches and orb are of French workmanship and were added by James V. The arches have leaves enameled in red and gold, the globe is blue with gold stars, and the cross black and gold set with Oriental pearls and an amethyst. The crimson velvet cap has four large pearls set in gold which show between the arches. In 1707 the Scots feared their regalia might be taken to England. They deposited it in a chest secured by three locks and placed this in Edinburgh Castle in the crown room which had two doors, one of oak and one of iron bars. The keys were hidden and have never been found. One hundred and ten years later the chest was finally opened. Sir Walter Scott who was present wrote that when the regalia was found to be safe the royal flag was hoisted on the castle and the crowd waiting on the hill broke into cheers. He added, "In 1819 the Crown-room having been fitted up, Yeoman-keepers organized and costumed in the fashion of olden days, the Regalia were put on public view." (Fig. 9).

English.—Richard Coeur de Lion's crown was so heavy that he had it supported over his head by two ears. Edward II owned nine crowns of gold and one of silver which were as much his personal property as his cloak. Henry V wore his crown on top of his helmet at the Battle of Agincourt (1415) where it was credited with having saved his life when part of it was chipped off. Henry VIII wore a crown with an arch rising from the sides. Elizabeth added an arch from front to back. In 1625 Charles I pawned part of the royal treasure in Holland to finance a fleet for a disastrous war with Spain. When James II was crowned some of the diamonds for the crown were hired for the occasion and afterwards returned to the jewelers.

In 1649 the Commons, under Oliver Cromwell, ordered the regalia to be totally broken up, the gold and silver melted down and, with the jewels, to be sold to the best advantage of the Commonwealth. This was done. As a consequence all the English crowns are comparatively recent. Some of the old jewels, however, were recovered by purchase or gift and are again set in crowns or other parts of the regalia.

The Black Prince's ruby is one of these. No one knows how it got back, but it is the oldest and most esteemed jewel in the English crowns.

It is an irregularly shaped ballas ruby, about two inches long, and the size of a small hen's egg. It is not cut in facets, but is in its original shape, and highly polished. In 1367 Pedro the Cruel, king of Castile, gave it to Edward of Wales, the Black Prince. The latter wore it sewn to the cap above his coronet. Henry V wore it in his crown at the Battle of Agincourt. When the new state crown was stolen by Col. Thomas Blood in 1671 the ruby must have fallen out, for it was found in his accomplice's pocket when they were caught fleeing from the Tower of London. It was set in the front of the Imperial State crown made for Queen Victoria.

After the destruction of the crowns under the Commonwealth, it was necessary to have new regalia made before Charles II could be crowned. The royal goldsmith was instructed to make a new coronation crown as much like the old one as possible which, like that one, was to be called *St. Edward's crown*. This crown, which is used only in the coronation ceremony, is made of gold. On the circlet are rubies, emeralds and sapphires, each set in a rosette surrounded by diamonds. From the rim rise four crosses alternating with four fleurs-de-lis set with diamonds and other jewels. The two arches are jeweled and are bordered with silver "pearls." The cross has a large pearl at the top and a large pear-shaped pearl hangs from a tiny bracket on each of the arms of the cross. The crown is edged around the lower rim with ermine, and is lined with a purple velvet cap. (Fig. 10.)

The state crown was made for Queen Victoria in 1838. The circlet is of silver openwork. In the front is a diamond weighing just under 310 carats which was part of the *Star of Africa*. On the back is the Stuart sapphire. Between them are clusters of diamonds with emeralds or sapphires in the center. The crosses above the rim are set with brilliants, three have emeralds in the center, but the one in the front of the crown has the Black Prince's ruby. The fleurs-de-lis have rose-cut diamonds and, in the middle, a ruby. The arches are made of oak leaves formed of diamonds with large pearls for the acorns. The orb is covered with diamonds and a large sapphire is set in the center of the cross. The velvet cap is purple and is edged with miniver (or ermine). (Fig. 11.)

The imperial crown of India was made for the coronation of George V as emperor of India at Delhi in 1911 when it was discovered that English law forbids taking the crowns out of the country. It has eight half arches which rise upward to the orb instead of being horizontal or depressed beneath it. It is silver set with dia-

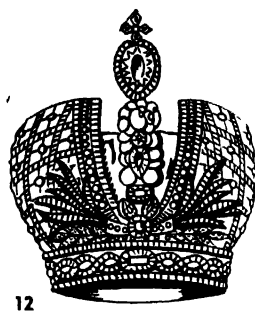
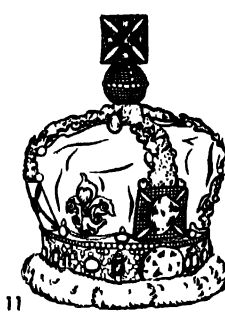
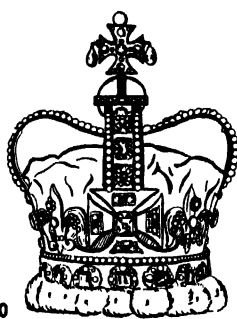


FIG. 9. Scottish crown. FIG. 10. St. Edward's crown.

FIG. 11. English State Crown. FIG. 12. Russian crown of Catherine the Great.

monds, the large stones are emeralds and rubies and, in the circlet, some sapphires.

The prince of Wales' crown is gold and has only one arch rising from the sides to meet under the orb. There are no jewels on it. The velvet cap is crimson.

The queen's state crown is silver set with diamonds including the Koh-i-Noor. It has eight arches and the cap is purple velvet. It was made for Queen Mary in 1911.

Russian.—The Russian crown, made for Catherine the Great in 1762 was an open lace-work of diamonds and brilliants with central bands of enormous pearls. It was built up on the sides leaving space in the center, from front to back, for an arch which supported the orb, the globe of which was formed of a single large ruby. (Fig. 12.)

French.—French crowns were surmounted by a fleur-de-lis instead of the orb. The king's crown had four arches rising from the eight fleurs-de-lis on the rim. The dauphin's crown also had eight fleurs-de-lis above the circlet but the four arches were in the form of dolphins.

Coronets.—Like crowns coronets have varied according to country and time. In England the duke's coronet is distinguished by the eight strawberry leaves on the circlet. The marquis' coronet has four strawberry leaves alternating with golden balls. The earl's coronet has eight tall points, topped by a ball, and, between the points, eight small strawberry leaves set close to the rim. The viscount's coronet has sixteen balls on the rim, while the baron's has a total of only six.

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MARCIA COTTIS HARTY,
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CROWTHER, krou'thër, Samuel Adjai, Anglican bishop: b. Ochugu, east of the kingdom of Dahomey, about 1809; d. Africa, Dec. 31, 1891. He was the first Negro bishop of the Church of England. He was carried into slavery in 1821, but was freed, with a large company of his countrymen, by a British man-of-war in 1822; was placed in the mission school at Bathurst and was the first student enrolled

in the Fourah Bay College where he subsequently became an instructor. He finished his education in England, where he took orders in the English church in 1843, became a missionary at Akessa and accompanied the first and second Niger expeditions, publishing a narrative of the latter. In 1864 he was consecrated bishop of the Niger and filled that place with honor. He published a dictionary and grammar of the Yoruba language (1852); a primer (1860), a grammar of Nupe, and a translation of part of the New Testament into the Yoruba

CROYDON, municipal and parliamentary borough, England, in County Surrey, 10 miles south of the heart of London, of which it is practically a suburb; near the sources of the Wandle and not far from the Banstead Downs; on the London and Brighton Railroad. It is a place of ancient origin, but its recent rapid increase is due to the overflow of London. The municipal borough includes South Norwood and Thornton Heath. It has important corn and cattle markets and boot and shoe manufactures. It returns one member to Parliament. Of special interest are the remains of the ancient palace. It is the site of London's principal airport. Pop (1939 est.) 243,900; (1949 est.) 252,000.

CROZAT, krô-zâ', a prominent French family of financiers and art collectors. **PIERRE, BARON DE THIERS**: b. 1661; d. 1740, was treasurer to the king and his various acquisitions included 19,000 original drawings, 2,000 engravings, 400 paintings, 1,382 intaglios and cameos and a library of 20,000 volumes. At his death, the collections passed to his nephews, Louis-François, d. 1750; Joseph-Antoine (1696-1740), and Louis-Antoine, d. 1770, who added many beautiful things. The collection of pictures was finally acquired by Catherine II of Russia. Between 1729 and 1742 a finely illustrated catalogue of the collection was published under the title of "Cabinet Crozat."

CROZER THEOLOGICAL SEMINARY, Upland, Pa., (post office, Chester, Pa.). Founded in 1867 by the heirs of John P. Crozer. The school is on a large campus and endowed with buildings and invested funds to the amount of a million dollars. It has a faculty of 9 professors and instructors, an enrollment of 51 students and a plant valued at \$400,000. It is under Baptist auspices.

CROZET, krô-zê, **ISLANDS**, a group of five, in the southern portion of the Indian Ocean, be-

tween Kerguelen and Prince Edward islands, about 1,500 miles off the southeast coast of Africa. They are all of volcanic origin and the most easterly, called East Island, has precipitous cliffs and in the interior lofty peaks, exceeding 5,000 feet. They were discovered in 1772 by the French explorer Marion-Duffresne, accompanied by Crozet, who was the historian of the expedition, and for whom the group was named. The largest island, Possession, was visited by the Challenger expedition in 1873, and is believed to be about 20 miles long by 10 broad. The total area of the group is about 200 square miles. The archipelago is a dependency of Madagascar, which became a French colony in 1896; in 1925 the islands were made a national park. Rabbits released there have survived, but there are no permanent human inhabitants.

CROZIER, krō'shēr, John Beattie, English philosophical writer: b. Galt, Ontario, Canada, April 23, 1849; d. London, England, Jan. 8, 1921. Educated at Toronto University, in 1872 he began the practice of medicine in London, where he also studied philosophy and economics. His first publication to attract attention was *Civilization and Progress* (1885). The *History of Intellectual Development* (1897-1901) earned him a Civil List pension. He wrote an autobiography, *My Inner Life* (1898); *The Wheel of Wealth* (1906); *Sociology Applied to Practical Politics* (1911); and *Last Words on Great Issues* (1917).

CROZIER, William, United States army officer: b. Carrollton, Ohio, Feb. 19, 1855; d. Washington, D.C., Nov. 10, 1942. Graduating from the United States Military Academy in 1876, he served for three years in the West against the Sioux and the Bannock Indians; was instructor of mathematics at West Point 1879-1884, when he entered the ordnance department, commissioned captain in 1890. He invented a wire-wound gun, and with Gen. Adelbert R. Buffington, a disappearing gun carriage. During the Spanish-American War he was inspector general for the Atlantic and Gulf coast defenses; was in the field in the Philippines in 1900; chief ordnance officer of the Peking relief expedition (1900); and president of the Army War College (1912-1913). In World War I he was appointed chief of ordnance with the rank of brigadier general; in 1917-1918 he was a member of the Supreme War Council, which arranged pooling of ordnance for all the Allied armies. After serving as commander of the northeastern department of the United States Army in 1918, he retired from active service. He published *Ordnance and the World War* (1920). His *Notes on the Construction of Ordnance* was used as a textbook in schools for officers. He was buried in Arlington National Cemetery.

CROZIER, William John, American professor and scientist: b. New York, N. Y., Aug. 28, 1892. Educated at the College of the City of New York and at Harvard, he won a traveling fellowship 1915-1918, which he spent at Bermuda Biological Station for Research. Becoming chairman of the Relief for Belgium Educational Foundation in 1934 he was also a visiting lecturer to Belgian universities and Lowell lecturer at Harvard. In World War II he was operations analyst to the United States Army Air Force (1944-1945). He has been co-editor of the *Journal of General Physiology* since 1924

and a member of the editorial board of the *Journal of General Psychology*, and has written a monograph on experimental biology. He is an authority on marine zoology; adaptation; animal behavior; irritability; temperature characteristics; and the central nervous processes in vision.

CROZIER, William Percival, British newspaper editor: b. Stanhope, County Durham, England, 1879; d. Manchester, April 16, 1944. Educated at Trinity College, Oxford, he joined the *Manchester Guardian* in 1903, was director of the *Manchester Guardian and Evening News* from 1921; and from May 1932 was editor of the *Guardian*. He was noted for his liberal viewpoint and his support of the oppressed, carrying on the traditions of his famous predecessor Charles Prestwich Scott. He published *Letters of Pontius Pilate* (1928); and contributed to J. L. Hammond's *Life of C. P. Scott* (1934).

CRUCIBLE. See CHEMICAL APPARATUS.—*Quantitative Analysis* (Gravimetric).

CRUCIFERAE. See BRASSICACEAE.

CRUCIFIX. See CROSSES AND CRUCIFIXES.

CRUCIFIXION. The history of crucifixion as a mode of punishment for crime must be studied as a part of the Roman system of jurisprudence rather than of any Eastern system, Asiatic or Grecian. Greece and Asia had indeed from very early times occasionally resorted to it; but the practice did not become universal. The Hebrews, for example, adopted or accepted it only under Roman compulsion: under their own system, before Palestine became Roman territory, they inflicted the death penalty by stoning. At Rome, however, from the period of the Republic until the 4th century (when Constantine, in memory of the Passion of Jesus Christ, abolished this form of punishment) it was customarily inflicted upon slaves found guilty of denouncing their masters. Provincial brigands might also be crucified, but the crucifixion of a Roman citizen was never permitted by law.

CRUCIFIXION IN ART. The Crucifixion symbolizes the triumph of Christ and the doctrine of Redemption, yet appears in art only long after the abolition of this degrading punishment. Early representations are disguised, as a dolphin around an anchor, a lamb on a cross, or Christ as orant (arms outstretched in prayer).

The first real scene is in the Rabula gospels, painted in the monastery at Zagba, Mesopotamia, in 586. A nimbused, living Christ, wearing a long tunic, is attached by four nails. Above are the inscription, sun, and moon; below, centurion with lance, soldier with sponge, three dice-playing soldiers, suppliant Mary, gesturing John holding a book, three holy women. Symbolism is giving way to realism through gesture and facial expression. This scheme persists until about the 12th century.

The Crucifixion is rarer in the West, the earliest certain representation being the nude Christ at Narbonne described by Gregory of Tours about 593. Such realism shocked the faithful, and by the 8th century the clothed Christ is standard in both East and West.

For some time there are only variants on this theme. In the period of the Carolingians and the

Ottos of the Holy Roman Empire are added the Evangelists, Adam and Eve, church, and synagogue. In Italy the partially nude Christ appears. The hand to cheek gesture of Mary and John, expressive of sadness, continues in the West into the Renaissance, though the East returns in the 11th century to the unemotional representation. These innovations continue primarily in Romanesque crucifixes. National differences arise but Christ the triumphant Redeemer, sometimes crowned, is usually maintained.

In the 13th century, inspired by mystics like St. Francis, a new concept arises in the West—the human drama of the Crucifixion. Christ is dead or suffering, His body hanging or contorted by the crossed feet pierced by one nail. The regal crown is replaced by the crown of thorns. Mary collapses with grief. To this, Giovanni Cimabue adds crowds of people, a scheme continued in the 14th century by Giotto di Bondone and later elaborated. The trend toward increased agony has the Magdalen clutching the cross, angels weeping as they catch the blood.

Renaissance iconography changes little but tends to free Christ from the throng, to represent Him as a perfect man, thus reemphasizing the mystery and triumph of the Redeemer. The tortured Christ continues in some northern regions in the Baroque period.

In general the nude Christ, crowned with thorns, head inclined, attached with three nails, continues to the present day. Compositional and emotional elements vary according to the artist's temperament and the taste of the period.

MARGARET A. ALEXANDER.

CRUDEN, krōō'd'n, **Alexander**, Scottish bookseller and scholar: b. Aberdeen, Scotland, May 31, 1701; d. London, England, Nov. 1, 1770. Educated at Marischal College, Aberdeen, with a view to the church, he early showed signs of insanity, which recurred at intervals during his life. He became a private tutor, but not succeeding in this profession, he went to London in 1732 and opened a bookseller's shop. Influential friends obtained him the title of bookseller to Queen Caroline. Confined to a madhouse for a few months, he escaped and wrote an account of his experience, sued for damages, and then published a pamphlet on the unsuccessful trial. As corrector of the press for classical works he was very accurate, but this work seems to have increased his insanity, for he now believed himself to be divinely appointed as Corrector of the People, and he wrote and preached and petitioned to obtain such a post. After another brief confinement he published in a magazine *The Adventures of Alexander the Corrector*.

In spite of his aberrations he completed by 1737 his great lifework, *A Complete Concordance to the Holy Scriptures of the Old and New Testament* . . . compiled with great industry and accuracy. The 1824 edition of the *Concordance* contains a biography of him by Alexander Chalmers.

CRUDEN, parish, Scotland, in East Aberdeen. It is the fishing port for Cruden Bay on the North Sea, 7 miles south-southwest of Peterhead. During the summer it is a seaside and golfing resort; the golf course, called the Ward of Cruden, lies along the sands and at its northern end is the fishing village of Port Erroll. Slains Castle, now a ruin, was once the seat of the earls

of Erroll, hereditary high constables of Scotland. James VI of Scotland destroyed it in 1594. Pop. (1951 est.) 2,294.

CRUDES. See **CHEMICAL INDUSTRIES**.—*Petroleum Products*.

CRUELTY, in law, has no narrowly defined or technical meaning, but is a generic term applicable to all categories of wilful mistreatment, particularly the infliction of unjustifiable physical pain or suffering. Cruelty to animals was not a crime under the early common law, but at the present time statutes in both England and the United States make it a criminal offense to torture or torment living creatures. Among other acts which are unlawful are wilful or wanton injury, neglect, or purposely inflicted ill treatment. Many states have societies for the prevention of cruelty to animals, which are frequently supported by public funds to some extent and which sometimes have limited power to enforce the laws on this subject. Cruelty to children is punishable not only by criminal action but by removal of the mistreated children from the custody of parents, guardians and others who are guilty of abusing them. Depending on the wording of the particular statute involved, cruelty may include the failure to furnish food, clothing, shelter or medical care, as well as the infliction of physical abuse. In the law of domestic relations, cruelty may be a ground for either separation or absolute divorce. As a general rule, the question of what constitutes cruelty depends on the facts of the particular case. Among the acts which may be considered by the courts as cruel treatment are conduct endangering physical safety and health, certain kinds of verbal abuse, and the infliction of mental suffering. See also **DESERTION**.

RICHARD L. HIRSHBERG.

CRUIKSHANK, krōōk'shāngk, **Ernest Alexander**, Canadian soldier and historian: b. Welland County, Ontario, Canada, June 29, 1853; d. Ottawa, June 23, 1939. Educated at Upper Canada College, he farmed for a time in Ontario, becoming warden of Welland County in 1886. He had joined the militia in 1877, and rose by 1915 to the rank of brigadier general. After seeing service in World War I he became director (1918-1921) of the Historical Section of the General Staff at Ottawa, when he retired. From 1919 until his death he was chairman of the Historic Sites and Monuments Board of Canada. His writings include papers for the *Transactions* of the Royal Society of Canada, the *Papers and Records* of the Ontario Historical Society, and others. His books on early Canadian history include *Battle of Lundy's Lane* (1889; 3d ed., 1894); *Battlefields of the Niagara Peninsula* (1891); *Battle of Fort George* (1896); and he edited *Documentary History of the Campaign on the Niagara Frontier, 1812-1814*, 9 vols. (1896-1908). Later he wrote a *History of the Great War* (1920); *The Life of Sir Henry Morgan* (1935); and *The Political Adventures of John Henry* (1936).

CRUIKSHANK, **George**, English illustrator and caricaturist: b. London, England, Sept. 27, 1792; d. there, Feb. 1, 1878. Family necessities compelled him when still a child to produce what he could, and the want of careful preliminary study at his outset in art affected his

productions through a great part of his career. Hence his defects were chiefly those of taste, and these have resulted in his being popularly ranked somewhat lower as an artist than his merits deserve. His drawing was always faithful, precise and felicitous, his facility amazing and his invention inexhaustible. The catalogue of his productions prepared by the keeper of the prints in the British Museum comprises 5,500 articles, many of them recalling Rembrandt's work by their richness in light and shade. The earliest of his known drawings is dated 1799, when he was only seven years of age, and when 15 he was comparatively distinguished. His first occupation was designing illustrations for children's books and popular songs. He contributed to *The Scourge* and *The Meteor* and at about the same time made sketches referring to the trial of Queen Caroline. In 1837 Cruikshank commenced in *Bentley's Miscellany* his famous series of etchings on steel illustrating Dickens' *Oliver Twist*, full of pathos, humor and tragic power; the illustrations for the *Waverley Novels*; and 15 plates for *Don Quixote*. Having connected himself with the temperance movement he produced the *Bottle*, a powerful series of designs, characterized, from its subject and the artist's object, by inevitable vulgarity, but pregnant with genius and high moral teaching. In 1830 he tried to paint and while he could not handle his tools well, he nevertheless displayed here as elsewhere his keen sense of caricature. Of these efforts the best are two: *Cinderella* in the South Kensington Museum and *The Worship of Bacchus* (National Gallery). In spite of his genius, industry and homely mode of life he never succeeded in acquiring a competency and was compelled in extreme old age to depend on the aid of his admirers. His true life-work consisted in illustrating the costume, manners and vices of the people for a period of considerably more than half a century.

Consult Bates, William, *George Cruikshank* (London 1878); Jerrold, William Blanchard, *Life of George Cruikshank*, 2 vols. (London 1882); Stephens, Frederic George, *A Memoir of George Cruikshank* (London 1891); and Chesson, Wilfrid Hugh, *George Cruikshank* (London and New York 1908); Cohn, Albert Mayer, *Bibliographical Catalogue of the Printed Works Illustrated by George Cruikshank* (London 1914); also *Cruikshank's Water-Colours* (London 1903).

CRUISER, an armed vessel of high speed, considerable gun power, and long cruising radius. Also the name given to a motor yacht fitted with living accommodations. Privateers (q.v.) were called cruisers in the 18th century. By the year 1800 the name was generally applied to frigates (q.v.). The British Navy evolved a cruiser type from fast dispatch vessels, and completed the *Shannon* in 1877. The United States Congress appropriated funds for three cruisers in 1883, *Chicago*, *Atlanta*, and *Boston*. In 1886 the German Navy had ships called frigate-built cruisers. Types of cruisers include: *Armored* cruisers having side armor and an armored deck; *Protected* cruisers having an armored deck but no side armor; *Belted* cruisers having a belt of armor around the water line and an armored deck; *Scout* cruisers having no armor, light armament and very high speed; *Battle* cruisers having fewer heavy guns than a battleship, less armor and much higher speed. Treaties for the limitation of naval armament in 1922 and 1930 affected cruiser design. The United States Navy developed new types of cruisers: *Heavy* cruisers (CA) with 8-inch guns; *Light* cruisers (CL)

with 6-inch guns; *Anti-Aircraft* cruisers (CLAA) with high-angle 5-inch guns; and *Large* cruisers (CB) with 12-inch guns. In June 1954 the United States had in commission 14 CA, 3 CL, and 1 CLAA; in the Reserve Fleet 2 CB, 13 CA, 30 CL, and 8 CLAA. See also UNITED STATES—United States Navy; WARSHIPS, MODERN.

CRUMMELL, Alexander, American colored Episcopal clergyman: b. New York, March 3, 1819; d. Point Pleasant, N. J., Sept. 9, 1898. His father was a native African and his mother a free woman. He received his education at the Oneida Institute and in 1839 applied for admission to the General Theological Seminary. His request was refused owing to the intense prejudice against the higher education of the Negroes. He accordingly went to England in 1849 and graduated at Cambridge University in 1853. He engaged in missionary work in Liberia 1853-1873, when he went to Washington, D.C., and founded Saint Luke's Church, of which he was rector until 1895. In 1897 he organized the American Negro Academy in New York. He published *The English Language in Liberia* (1861); *The Future of Africa* (2d ed., 1862); *The Negro Race Not Under a Curse* (1863); *The Greatness of Christ, and Other Sermons* (1882); *Africa and America* (1891).

CRUSADE, Children's. See CHILDREN'S CRUSADE, THE; CRUSADES.

CRUSADES (Portug. cruzado, "marked with the cross"), the military expeditions which were sent out by the Christian peoples of the West from the end of the 11th till the latter half of the 13th century for the conquest of Palestine. From the earliest times pilgrims had gone to what, because of Christ's life therein, was called the Holy Land. In 637 Palestine fell into the hands of the Mohammedans, but, though several churches were turned into mosques, Christians were allowed full liberty to come to the holy places in Jerusalem for nearly four centuries. In 969 the Fatimite dynasty extended its rule over Egypt and Palestine, and with this change of rulers there came an end of the cordial relations. The insults, and even injuries, that Christian pilgrims suffered aroused bitter feeling in the West. Finally Pope Silvester II (999-1003), one of the best known of the medieval popes and famous for his very practical character, issued a call for volunteers for the purpose of freeing the Holy Land. His summons met with no success. In 1073 Palestine came under the control of the Seljukian Turks and the conditions there became even worse than before for the Christians. Pope Gregory VII (Hildebrand), in 1074, asked the Western nations for help for their suffering brethren in the East and even suggested to the German emperor, Henry IV, that it would be easy to raise an army of 50,000 for the rescue of the Holy Land from the hands of unbelievers. The idea of the crusades that had thus been incubating in Western minds for nearly a century did not come to fruition until 1095, when the awful state of affairs that Christian pilgrims had to encounter in the Holy Land became unbearable. Peter of Amiens, surnamed the Hermit, saw the terrible situation while on a pilgrimage to the Holy Sepulcher, succeeded in arousing the interest of Pope Urban II and obtained permission to preach a crusade.

The first great cause of the Crusades, then, was the earnest desire to free the Holy Land. It seemed to the medieval Christians to be a question of the maintenance of their religious honor that the infidel should not be allowed to occupy the holy places. Other causes conspired to produce action just at this period. It was felt by Western rulers, and especially by the popes, that unless the Turks were repressed in the East, they would gradually acquire irresistible power and eventually invade the West, with hope of success.

For the lower classes in the West, on the other hand, life had become almost intolerable because of the oppression of the nobles, the frequent wars and the almost servile duties that feudalism enjoined. In addition to other causes of dissatisfaction, the harvest had practically failed in the West for several years and the year 1095 proved to be a particularly bad year for farmers; many of those dependent on the land and its products suffered severely from famine. These material difficulties predisposed the people to risk all in the hope of betterment. There was little chance to rise in the West and the vague opportunities of distant war seemed to promise much. Besides, the spirit of chivalry had come in and many of the nobles devoted themselves to the cause with the idea that they would thus win favor of the heavenly queen, the mother of the Lord, whose life had been lived in Palestine and whom they had chosen for their patroness. Devotion to the Blessed Virgin also caused women to urge their husbands, brothers and other male relatives to join in the holy war for the Christian possession of her home at Nazareth.

It needed only the intimation of authority to precipitate an Eastern expedition and that came very naturally from the popes as the acknowledged spiritual heads of Christendom. Pope Urban II, having heard Peter of Amiens' story of Christian suffering in the Holy Land, summoned a council to meet at Piacenza in 1095 and gave Peter the opportunity to address the multitude, which assembled in such numbers that he had to talk in the open air. In November 1095, ambassadors from all the nations were present at a council at Clermont, where Peter's words had so much power that with one voice the multitude called out "God wishes it," and this became the slogan of the Crusade.

First Crusade.—In 1096, a number of armed bodies set out in different divisions. Many of these hosts were unamenable to military discipline, and, being unprovided with even the necessities for such an expedition, were almost completely destroyed in the different countries through which they had to pass before reaching Constantinople, which had been chosen for their place of meeting. Only a few stragglers found their way home again or succeeded in maintaining themselves for a time until the arrival of the more regularly organized bodies of troops which set out the next year. With these were most of the distinguished men whose names are associated with this first great chivalric effort to redeem the Holy Land from the infidel. At the head of nearly 100,000 men were Godfrey of Bouillon, duke of Lower Lorraine; Hugh of Vermandois, brother to Philip, king of France; Baldwin, brother of Godfrey; Robert II of Flanders; Robert of Normandy, brother of William II, king of England; Raymond of Toulouse; Bohemund I of Otranto, son of Robert Guiscard; Tancred, cousin of Bohemund; and other heroes.

Tancred is the hero of whom so many poets have written. He was what Chaucer called "a verray parfit gentil knight." This First Crusade later formed the subject of Torquato Tasso's *Jerusalem Delivered* (1575), which owed a great deal of its interest to the fact that it was written while the victory at Lepanto (1571) was fresh in the mind of the poet and still well remembered by his readers, for, while the Crusades are considered to end with the last quarter of the 13th century, the gathering of the naval force under Don John of Austria that overcame the Turks was really the result of the crusading spirit.

The various armies of the First Crusade gathered at Constantinople about Christmas 1096. Here they were delayed for some time by the diplomacy of the Greek emperor, who wished to be assured that the immense forces which had come partly as the result of his own request for aid would not prove the ruin of his tottering empire. About Pentecost, 1097, the Crusaders crossed over to Asia by the Strait of Gallipoli, and their first conquest was the town of Nicaea in June 1097. Shortly after this, on July 4, the Crusaders met an Eastern army in pitched battle for the first time, at Dorylaeum (now Eskişehir) and put it to flight. The crusading legions now marched through Asia Minor until they reached Antioch. They would probably have been long delayed in the siege of this town but for treachery which threw it into their hands in June 1098. The citadel, however, remained in possession of the Turkish garrison. Before the Christians captured it, they themselves had to stand siege in Antioch from a Turkish army which surrounded the town soon after its capture. After three weeks of siege the Crusaders were reduced to a very pitiable condition, but on June 28 they made a vigorous sortie and succeeded, in spite of their famished and exhausted condition, in completely routing the Turkish besiegers.

The Crusaders remained nearly a year in the neighborhood of Antioch and only in May 1099 was the march against Jerusalem begun. The siege of the city was commenced early in June. Finally, after six weeks of a fierce siege, the city was captured by a two days' storming, on July 15. Godfrey of Bouillon was chosen king of Jerusalem, but humbly refused to wear the king's crown on the spot where the Saviour of the world had worn a crown of thorns. He accepted as his designation instead of king that of Defender of the Holy Sepulcher. After scarcely a year of sovereignty, however, he died in 1100 and was succeeded by his brother Baldwin. Baldwin had separated from the main army of the Crusaders while it was in camp in the neighborhood of Antioch and had proceeded to Edessa (Urfä). This city was in possession of a Christian prince, who was able to maintain himself only with difficulty against the Mohammedans. Baldwin concluded a treaty by which he agreed to aid this prince against the Mohammedans on condition that he himself should be his successor on his death. This treaty was made in February 1098, and, as the Prince of Edessa was killed soon after in a popular insurrection, Baldwin asserted effectually his claims to succeed him and soon made himself ruler of an extensive territory stretching even beyond the Armenian Mountains and the plain of Mesopotamia. He was accordingly his brother's natural successor as the ruler in Palestine.

Second Crusade.—In 1144 the Saracens re-

captured Edessa. This produced great consternation throughout Europe, because it was feared that the other acquisitions made by the Christians during the First Crusade would also fall once more into the hands of the infidels. As a result, Pope Eugenius III called upon Saint Bernard of Clairvaux to preach the Second Crusade. The two leaders of the expedition were the German emperor, Conrad III, and the king of France, Louis VII. They collected about 140,000 men and in 1147 led them to the East. This Crusade was entered upon with great enthusiasm. It is recorded that after Bernard's sermon the demand for cloth crosses—used as a sign of the wearer's promise to go on the Crusade—so exceeded the supply provided that Bernard had to cut up his own garments to help meet the shortage. In spite of such fervor, however, the army failed in its purpose of recapturing Edessa, and indeed only served by its presence still further to weaken the already almost tottering kingdom of Jerusalem. The crusading armies returned to Europe in 1149, and it was nearly 50 years before any other attempt was made to diminish the dominion of the Saracens.

Third Crusade.—In 1187 Saladin took Jerusalem from the Christians and the zeal of the West blazed out once more. The three principal monarchs of Europe, Frederick I (Barbarossa), emperor of Germany; Philip II, king of France; and Richard I (Cœur de Lion), king of England, offered to assume the cross and to lead their armies in person against the Saracens. Frederick's army succeeded in reaching the Holy Land only after having overcome an immense Turkish army at Philomelion (Aksehir) on May 7, 1190. Not long after his victory, Frederick was drowned in the river Calycadnus (Göksu) and this took all the spirit out of his troops. His son Frederick led the army to the siege of Acre, but after his death, in January 1191, the German army abandoned the expedition. Philip and Richard agreed to unite their forces at Messina, in Sicily. Here they stayed until the spring of 1191. Philip reached the Holy Land on the day before Easter and joined the other Crusaders before Acre. Richard's fleet was dispersed by a violent storm and his wife and mother were detained as prisoners on the island of Cyprus, to which their vessel had been driven, by Isaac Comnenus, the heartless, despotic ruler of the island. On Richard's arrival from Rhodes, where his vessel had been compelled to put in, he succeeded in taking Isaac and his daughter prisoners and had himself proclaimed king of Cyprus. It was not until the beginning of June that he joined the French at Acre. Owing to jealousies between the two monarchs, the French king abandoned the expedition shortly after the fall of Acre.

Richard succeeded in many wonderful exploits against the Saracens, but was not able to accomplish much in regaining territory. He did not succeed in recapturing Jerusalem, and, though he defeated Saladin at Azooz and captured Joppa (Jaffa) he at last despaired of the capture of Jerusalem and made a truce with Saladin by which the seacoast from Tyre to Joppa remained in the possession of the Crusaders, and Christians were allowed full liberty to visit the Holy Sepulcher.

Fourth Crusade.—The Fourth Crusade was due to the zeal of Pope Innocent III. Its chief promoters were Thibaud of Champagne, Baldwin, Count of Flanders, and Enrico Dandolo, the old

doge of Venice. Boniface III, Count of Montferrat, was chosen leader of the expedition. The Crusaders assembled at Venice in 1202 and were induced by Dandolo to attack Zara in Dalmatia, a town which had formerly belonged to the Venetians but which had renounced its allegiance. This relegation of the religious motive to a secondary position in favor of Venetian commercial interests exemplified the underlying spirit of the Fourth Crusade. The capture of Zara was contrary to the wish of the pope, who excommunicated the Crusaders for their failure to fulfil their vow of proceeding to the Holy Land. News now came to the Crusaders' camp that there was a revolution in Constantinople and their aid was asked for one of the claimants to the throne. Dandolo seems to have been mainly responsible for encouraging the Crusaders to accept the invitation to proceed to Constantinople. The Crusade was thus entirely diverted from its original purpose and became an attack on the Byzantine Empire. Constantinople was seized and pillaged in 1204 much to the apparent consternation of the pope, but a Latin empire was established and Baldwin IX of Flanders became first emperor. Asked by the conquerors to ratify the subjugation of the Greek Byzantine empire and union with the Western Church of the schismatic Eastern, Innocent perforce acquiesced. But his hopes for a Crusade from Constantinople were disappointed; it soon became apparent that the new Latin rulers must devote all energies to maintaining their hegemony over hostile Greeks.

Children's Crusade.—The failure of so many expeditions to the Holy Land proved very discouraging and people began to wonder if there was not some cardinal fault in the make-up of the parties that went on the Crusade. It began to be said that the Holy Land would never be captured, except by those who were innocent. Accordingly, when Stephen, a French peasant boy, in June 1212, began to preach a children's crusade, he made many converts to his opinion that possibly children might accomplish what adults had failed in. Some 30,000 French children are said to have taken part in the expedition. A like movement began in Germany and soon proved to have almost as great a following. Over 20,000 German children crossed the Alps into Italy. Both expeditions, as might have been expected, came to grief. The French children were tempted on board vessels by designing slave merchants in Marseilles, and many of them were sold into slavery. Many of the German children lost their lives through the hardships they had to endure on the march. Some were lost at sea and some settled down here and there throughout Italy.

These expeditions represent a phase of that tendency to psychic contagion that sometimes comes over even intelligent people in an inexplicable way, and it is from this standpoint that they have been very much discussed in recent years. The Children's Crusade corresponds to the witch baiting of more modern times, or to some of the many spiritual manifestations of older periods. Some doubts have been thrown on phases of the history of the Children's Crusade, as for instance the fate of the French children, but there seems good reason to believe the account given here to be correct.

Fifth Crusade.—After an interlude of five years after the Children's Crusade, a Hungarian expedition went to Egypt and captured Dami-

few to many segments. In the higher members, the cephalon is usually fused to one to eight, generally eight, of the succeeding trunk segments to form the cephalothorax and the remaining trunk segments then constitute the abdomen.

The external surface of a crustacean consists of hardened material, constituting the exoskeleton, secreted by the underlying epithelium or epidermis. This exoskeleton is composed of layers of a flexible substance of carbohydrate nature termed chitin, usually reinforced and hardened through impregnation with lime salts, whence the name Crustacea. At segmental boundaries and the joints of the appendages the exoskeleton is thinner and more flexible than elsewhere to permit movement. However, the exoskeleton does not allow of very much growth; hence, the Crustacea moult at intervals. The old exoskeleton splits along the back and the animal pulls itself out of the old shell; and being now quite soft, expands considerably before the new exoskeleton (performed under the old one) sets and hardens. During this time, the animal is in the «soft-shell» stage and, being then susceptible to injury, usually retires to a secluded place. The Crustacea lack a true internal skeleton but the exoskeleton sends projections and folds into the interior to serve as attachment points for muscles.

In many Crustacea, the exoskeleton extends from the head region backwards as a hoodlike or bivalved free fold, termed the carapace, that covers part or all of the body, acting as an additional protection. The space thus formed between the body wall and the carapace may serve as a brood-chamber in which the eggs develop or may form on each side a branchial chamber in which the gills are accommodated.

Appendages.—The Crustacea are provided with leglike appendages that depend from the ventral surface of the body. Primitively each body segment bore a pair of appendages that were alike throughout the body length but at present appendages are often lacking from some body regions and present a great variety of form and function in different regions and in different crustaceans. The type of appendage present on a given body segment or body region does not necessarily correspond in different crustaceans. The crustacean appendage through all of its variations is classifiable into two fundamental types: the *foliaceous* and the *biramous*. The foliaceous type (Fig. B) is thin, flat, more or less lobed, and leaflike, employed chiefly in swimming and in maintaining a respiratory current. The biramous type (Fig. A), chiefly locomotory, consists of a basal piece or protopod bearing a pair of projections, an outer exopod and an inner endopod. Primitively the exopod and endopod are alike (Fig. A) but often they are altered in different directions for varied functions. Through loss of one of the projections, usually the exopod, the biramous appendage is converted into the uniramous type (Fig. D), seen in walking and grasping legs. All transitions exist between foliaceous, biramous, and uniramous appendages. Formerly the foliaceous type was considered the more primitive but present opinion inclines to regard the biramous as the original form of the arthropod appendage.

In general, the Crustacea have the following appendages (Fig. D). The cephalon bears two

pairs of antennae (of which the anterior pair is often termed antennules), long, slender, jointed feelers, heavily provided with tactile and chemical sense organs. In some of the very small Crustacea and in larvae they may also serve as swimming organs; thus in the Copepoda (Fig. C), the antennules, and in the Cladocera (Fig. E), the antennae act as swimming oars that by their strokes impart to the animals a characteristic jerky movement. Following the antennae come a pair of hard mandibles or jaws for chewing and two pairs of foliaceous appendages, the first and second maxillae, assisting in testing food and passing it into the mouth. Mandibles and maxillae occur at or behind the mouth opening and are collectively termed mouth parts. The head also bears eyes, chiefly in the form of a lateral pair, often mounted on movable stalks. These eyes are considered by some authorities to be true appendages and to represent an otherwise undistinguishable segment but this view is not generally accepted. Leaving out of consideration a possible eye segment, the cephalon then, as judged by its appendages, consists of five segments plus an anterior unsegmented head piece. Following the head region, the trunk may bear a series of similar foliaceous swimming appendages as in the fairy shrimps (Fig. G) and other phyllopods (see PHYLLOPODA); but more commonly, especially in the higher Crustacea or Malacostraca there follow on the mouth parts one to three, typically three, pairs of maxillipeds, biramous appendages intermediate between maxillae and walking legs, that really belong to the thorax but assist the mouth parts in testing, seizing, and mincing food. Behind them come usually walking legs, long, hard, jointed uniramous appendages, typically five pairs in the Malacostraca (Fig. D), which then have eight pairs of thoracic appendages or a total of 13 pairs for the entire cephalothoracic region. The two terminal joints of the first pair of walking legs may be enlarged and opposable after the manner of thumb and first finger to form a formidable claw, as in lobsters and crabs. The abdomen may lack appendages as in phyllopods and copepods but in the Malacostraca bears six pairs of biramous swimming feet, known as pleopods, the last pair of which may be greatly enlarged and broadened to form the uropods. These act together with the telson to form a powerful swimming fan that by a forward or flexor stroke drives the animal backwards. The last body joint, termed the telson, bears the anus and is devoid of appendages in higher Crustacea but may bear a pair of bristly projections, the furcal rami or cercopods, in lower types, as phyllopods and copepods (Fig. C). The telson is usually considered not to represent a segment but is regarded as a tail piece, corresponding to the head piece. There are then in the higher Crustacea six abdominal segments or a total of 19 for the entire body.

Very commonly some appendages are modified for sexual purposes. Any appendages may be so altered and the ones involved do not correspond in different groups of Crustacea. Thus in the male certain appendages may act as claspers to hold the female during mating, as the enlarged second antennae in fairy shrimps (suborder Phyllopoda, Fig. G), the antennules in Cyclops and other members of the order Copepoda (Fig. C), the enlarged terminal joints of some of the thoracic legs in the orders Amphipoda and

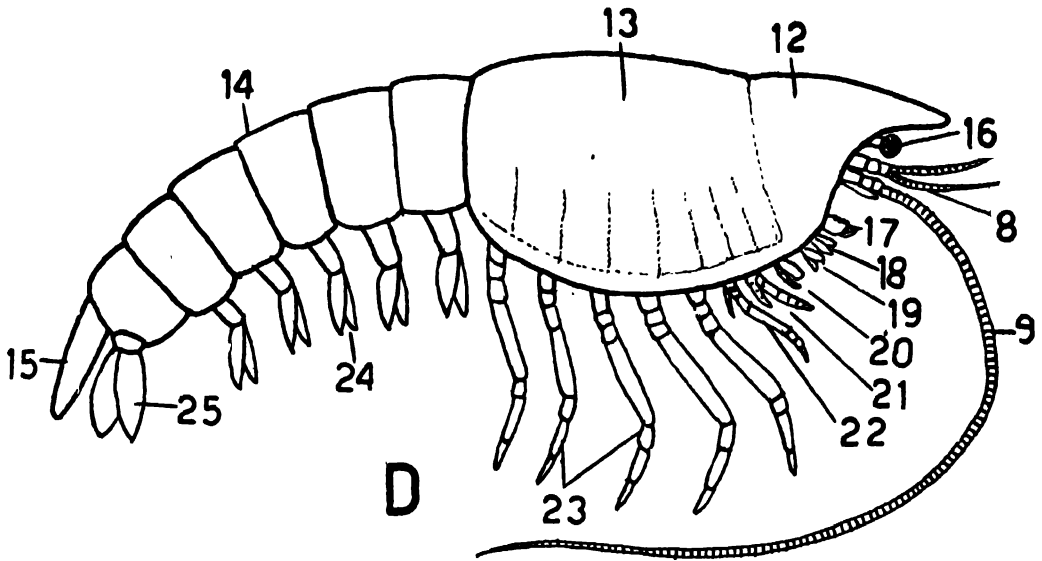


FIG. D. Schematic representation of a malacostracan crustacean, seen from the side. 8, antennule; 9, antenna; 12, cephalon; 13, thorax; 14, abdomen; 15, telson; 16, mandible; 17, first maxilla; 18, second maxilla; 19, first maxilliped; 20, second maxilliped; 21, third maxilliped; 22, walking legs, uniramous type; 24, pleopods, biramous type; 25, uropods, or last pair of pleopods.

Isopoda. Again, certain male appendages may be adapted for transferring sperm to the female as in the order Decapoda where the first or first two pairs of pleopods are modified into hard grooved structures for this purpose. Among females, modification of appendages occurs for attachment of eggs or to form a brood chamber in which the eggs develop.

Asymmetry among the appendages is of common occurrence, as the claws of the lobsters, one of which is a heavy crushing claw, the other a more elongate snapping claw. In the hermit crabs one claw is larger than the other and is employed in closing the mouth of the shell when the animal withdraws. An extreme case is seen in the male fiddler crab where one claw is of enormous size relative to the body; it is employed in courtship and fighting. These asymmetries are not linked to a particular side of the body, and the condition in a given individual can be reversed through regeneration experiments.

Muscular and Nervous Systems, and Sensory Organs.—The Crustacea have a well-developed muscular system beneath the epidermis, consisting of segmentally arranged bundles in the body region and flexor and extensor pairs in the appendages. The muscle fibers are of the striated type with a complicated microscopic structure comparable to that of vertebrate muscle fibers.

The nervous system is fundamentally of the ladder type, consisting of a pair of cords that bear primitively a ganglionic enlargement in each segment and are united at the ganglia in each segment by a transverse commissure like the rung of a ladder. However, in all except a very few of the lower Crustacea, the two cords are so closely approximated that the ladder arrangement is not evident and generally there are fewer ganglia than segments because of fusions among the ganglia. The cords begin with a pair of cerebral or brain ganglia situated above the digestive tube at the anterior end of the body but these are really compound ganglia

composed of the fused antennular and antennal ganglia and the optic lobes. The cords then continue as a pair of commissures encircling the beginning of the digestive tube below which they unite to form the apparent second pair of ganglia, the subesophageal ganglia, that also constitute the first ganglia of the ventral cords. The subesophageal ganglia are also compound consisting of the fused ganglia of the segments to which the mouth parts and maxillipeds belong. The nervous system then continues as the ventral cords lying in the midventral line close to the body wall, and presenting a variable number of ganglionic enlargements. The Crustacea also possess something approximating the vertebrate sympathetic system, a special set of nerve fibers supplying the heart, digestive tract, and other viscera.

The Crustacea are richly supplied with tactile and chemical sense organs in the form of sensory hairs, bristles, etc., located upon appendages and also on the general body surface. Two kinds of eyes occur, the unpaired median eye and the paired lateral eyes. The former is of the pigment cup type, consisting mostly of three such cups fused together, and occurs in the larval stage, hence often called the nauplius eye, and in some adults. The lateral eyes, similar in structure to the compound eyes of insects, are the type usually found in adult crustaceans; they may fuse to form a single median eye as in *Daphnia* and others. A static organ or organ of equilibrium occurs in the higher Crustacea imbedded in the antennae or other appendages. It consists of a small chamber containing one or more hard bodies or rock grains that rest upon sensory hairs. Movement of the bodies against the hairs gives the animal information as to its orientation. The Crustacea are devoid of organs of hearing but presumably can detect vibrations.

Digestive, Circulatory and Reproductive Systems.—The Crustacea in general lack a true body cavity or coelom. The interior space of

their bodies in which the digestive, circulatory, and reproductive systems lie is a blood space or haemocoel and is filled with blood. The Crustacea did originally have a coelom but this has been crowded down to a few small spaces by the expansion of the blood system.

The mouth is situated on the ventral surface of the head region and opens into a simple, mostly straight digestive tube that runs to the posterior end there opening on the telson by way of an anus. The fore part of the digestive tube may be enlarged into a grinding stomach that may be provided with strong chitinous teeth for grinding and hairs for sifting food. Attached to the middle part of the digestive tube there is often a pair of large glands, variously termed liver, hepatopancreas, and midgut glands. These play an important role in secreting digestive enzymes, absorbing the products of digestion, and storing excess food supplies, chiefly as fat.

The circulatory system belongs to what is known as the open type, i.e., there are no capillaries or definite veins but the blood from the arteries flows into large body spaces from which it slowly returns to the heart. The heart, situated in the middorsal region, is often quite elongated and may show segmental structure; its wall is perforated by openings or ostia often segmentally arranged through which the returning blood enters the heart. From the heart arteries proceed, mostly anteriorly and posteriorly, but soon become vague, passing into spaces (sinuses). Especially in the smaller forms there is a lack of definite vessels whereas the larger ones have arteries of some length and a system of sinuses. The blood contains amoeboid cells, similar to vertebrate leucocytes, and a dissolved oxygen-carrying substance which in most Crustacea is a hemocyanin, containing copper instead of iron as the important metal; hence the blood is colorless or bluish. However, some Crustacea are said to have red blood containing dissolved hemoglobin.

The smaller Crustacea lack a definite respiratory system, carrying on gaseous exchange through the general body surface and especially through the foliaceous feet which are often kept in rhythmic motion. The higher Crustacea are provided with gills, feathery or lamellate thin-walled structure borne chiefly on the bases of certain appendages. In the Decapoda, gills also occur on the sides of the thorax and are protected by the carapace which curves down over them to form on each side a branchial chamber. Through such a chamber a respiratory current is usually maintained from behind forwards through rhythmic movements of one of the more anterior appendages.

A pair of excretory organs occurs in the anterior part of the body as a coiled canal leading from a small remnant of the coelom to an exterior pore. They are believed to be remnants of originally segmentally arranged nephridia, one pair to each segment. The surviving pair is that belonging either to the antennary or the first maxillary segment, or, rarely, the pairs for both segments may be present.

The sexes are separate in the majority of Crustacea; hermaphroditism obtains in barnacles and some isopods. The two sexes are generally morphologically distinguishable by differences in the appendages already mentioned, further by

differences in size and shape. Either sex may be the larger and such size differences are often very great. The reproductive system is simple, consisting of a pair of ovaries or testes from which a pair of ducts leads to the external openings, variously located either in the body wall or at the bases of certain appendages. In the higher Crustacea, the male and female pores are always on different appendages. The sperm is often done up in packets or spermatophores for easier transference to females, and females may have special pockets in the exoskeleton for receiving and holding the spermatophores. The eggs are generally carried about by the female fastened by an adhesive substance to her appendages or are held in brood pouches. The eggs usually hatch to a free-swimming larva of which the most primitive type is the nauplius larva (Fig. F). This is a minute creature of oval form with three pairs of leg-like appendages that represent the antennules, antennae, and mandibles and with an unpaired eye. This larva usually passes through more advanced larval types before attaining the adult morphology and among many higher Crustacea the nauplius stage is passed during embryology and a more advanced type of larva emerges from the egg. A number of different larval types and stages occur among the higher Crustacea, many of bizarre appearance. The fresh-water Crustacea usually lack free-swimming larvae and have the adult morphology at hatching.

Parthenogenesis, i.e., development of the eggs without being fertilized by sperm, occurs in the orders Branchiopoda, Ostracoda, and Isopoda, and has been extensively studied in the first named, especially in the genus *Daphnia*. In this and related genera, females may be produced by parthenogenesis for many generations but at times males appear, and fertilized eggs having a heavy shell and capable of withstanding freezing and drying are laid. These invariably hatch into a female. Experiment has shown that the production of males is controlled by external factors, especially number of mothers per unit space.

Classification, Habits and Habitats.—The Crustacea are conveniently divided into two subclasses, the Entomostraca (q.v.) or lower forms and the Malacostraca (q.v.) or higher Crustacea. The Entomostraca are chiefly small or even microscopic forms that show a great variety of body form and appendage type and in general lack definite regionation. The Malacostraca are the larger, more definitely constructed types with 19 segments having the appendage types described above. The Entomostraca comprise the orders Branchiopoda, Ostracoda, Copepoda, Branchiura, and Cirripedia. The Branchiopoda are subdivisible into the suborders Phyllopoda, that includes the fairy shrimps (Fig. G) with elongated jointed bodies and at least 10 pairs of foliaceous feet, and the suborder Cladocera or water fleas such as *Daphnia* (Fig. E) with short, poorly segmented bodies enclosed except the head in a bivalved carapace and with four to six pairs of foliaceous feet. The ostracods or cyprids are completely encased in a bivalved carapace. The copepods exemplified by *Cyclops* in fresh water (Fig. C) and *Calanus* in the sea have an elongate body without carapace terminating in furcal bristles. The Branchiura or fish lice are copepodlike parasites found on fish and other cold-blooded

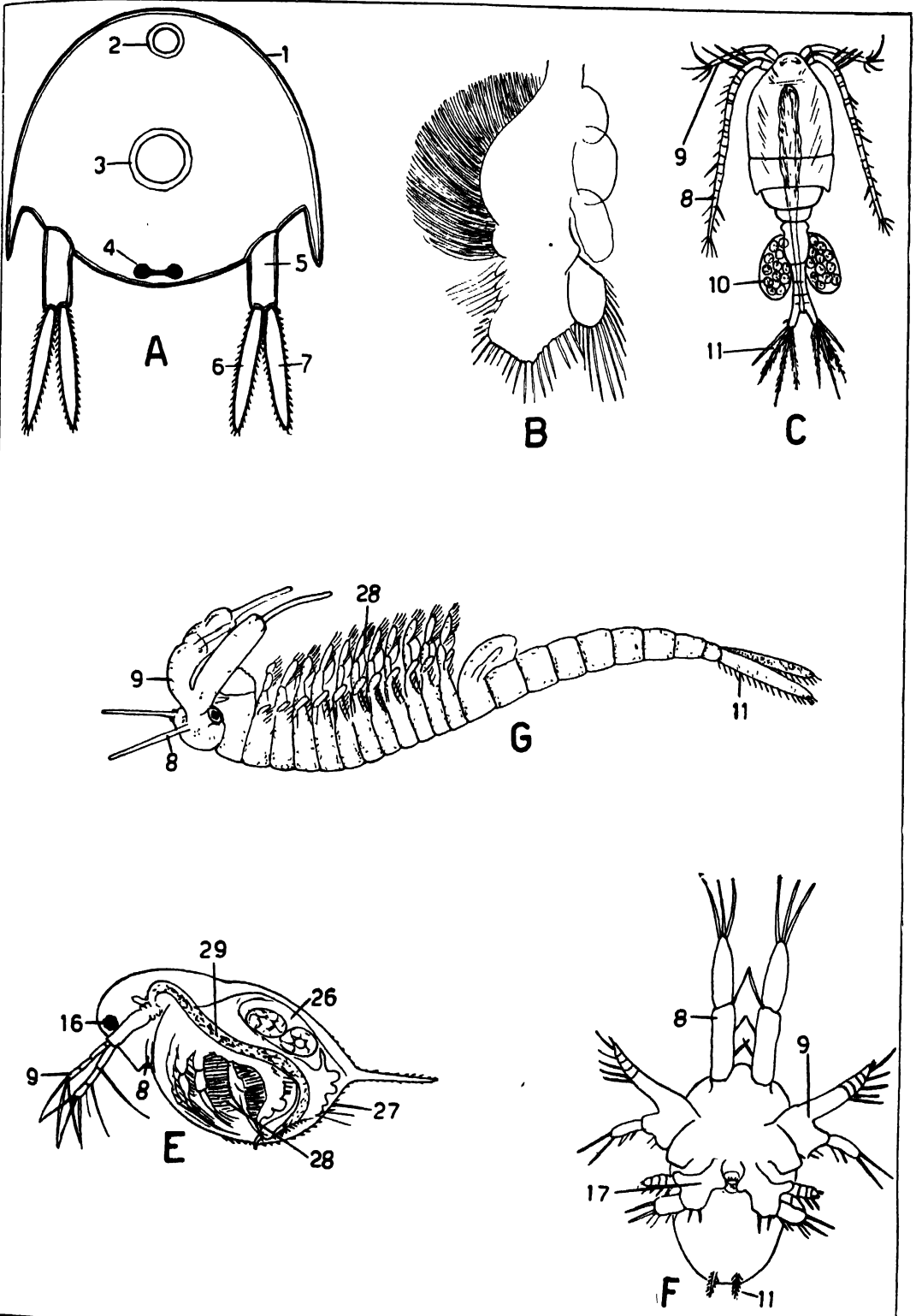


FIG. A.—Schematic cross section of the body of a crustacean showing biramous type of appendage.
 FIG. B.—Foliaceous appendage.
 FIG. C.—Cyclops (order Copepoda), female with egg sacs.
 FIG. D.—Daphnia (order Branchiopoda), parthenogenetic female with two embryos in the brood pouch.
 FIG. E.—Nauplius larva of Cyclops.
 FIG. F.—A fairy shrimp (order Branchiopoda), male with antennae modified into claspers.
 FIG. G.—A fairy shrimp (order Branchiopoda), male with antennae modified into claspers.
 1, exoskeleton; 2, heart; 3, digestive tube; 4, nerve cord; 5, protopod; 6, endopod; 7, exopod; 8, antennule;
 9, antenna; 10, egg sac; 11, cercopods; 16, lateral eye; 17, mandible; 26, brood chamber with embryos;
 27, carapace in form of bivalve shell; 28, foliaceous feet; 29, intestine.

aquatic vertebrates. The Cirripedia or barnacles are sessile animals enclosed in a carapace that contains calcareous plates; they are of two types: the rock barnacles fastened directly to rocks and the goose barnacles borne on a stalk.

The Malacostraca are divisible into the orders Leptostraca, Anaspidacea, Mysidacea, Cumacea, Tanaidacea, Isopoda, Amphipoda, Euphausiacea, Decapoda, and Stomatopoda. Of these only the Decapoda, comprising the lobsters, crayfish, shrimps, crabs, hermit crabs, the Isopoda, including the sowbugs, and pillbugs, and the Amphipoda, sandhoppers and scuds, are of popular interest.

The Crustacea are among the most common and familiar aquatic animals, found in both fresh and salt waters. They show a wide range of habits and habitats. The Entomostraca are primarily planktonic animals (i.e., swim about in the open waters) and play an important role in aquatic food cycles. Particularly copepods of the *Calanus* type occur in vast numbers in the surface waters of the ocean and furnish food for many other organisms. The fairy shrimps and other phyllopods mostly inhabit temporary fresh-water pools, appearing in very early spring and quickly completing their life cycles with the laying of thick-shelled eggs that can endure drought and freezing. Perhaps the most remarkable phyllopod is the brine shrimp, *Artemia*, that lives only in brine pools in a salinity ranging as high as 30 per cent sodium chloride, or about nine times the salinity of the ocean. Bottom dwelling habits are seen among various types of decapods, many of which live in crevices or dig burrows in shallow water. The spider crabs are distinguished by their extremely long and slender legs and the giant spider crab of Japan, whose legs may be 11 feet long, is the largest of living arthropods. The hermit crabs occupy empty snail shells and show marked body and behavior changes associated with this habit. The barnacles furnish an excellent example of adaptation to sessile life; their nauplius larvae swim about for a time and then settle head down on appropriate objects to which they become permanently fastened. Cave-dwelling habits with degeneration or loss of eyes and pale coloration occur in a number of fresh-water crustaceans, especially isopods. Adaptation to living on land is seen in various crabs in the tropics, known as land crabs, and especially among the isopods, of which the terrestrial members, known as sowbugs, pillbugs, and woodlice, are familiar objects under stones, flower pots, and boards or fallen logs. These terrestrial isopods have a special adaptation for air breathing in the form of a system of tubes similar to the tracheae of insects, occurring on certain abdominal appendages. Commensal habits, i.e., the habit of constant association with some other animal, are of common occurrence among the Crustacea, and various degrees of parasitism are also illustrated among them, with accompanying alterations of structure, often extreme. Many copepods and the related Branchiura lead a parasitic existence on fish and other animals and often show marked reduction of body structure and of appendages. An extreme case of parasitic degeneration is found in the group Rhizocephala, belonging to the order Cirripedia. These forms parasitize crabs and are reduced to a sacciform protrusion on the outside of the crab from which rootlike feeding extensions permeate the host's organs. The cirripede nature of the rhizocephalan parasites can

be recognized only through the embryology in which a typical barnacle nauplius appears.

Crustaceans in modern research.—Present research concerns chiefly plankton studies on Entomostraca, life cycles of crustaceans of economic importance, and hormones in crustaceans. Studies of abundance, distribution, population fluctuations, and so on, of Entomostraca are desirable because of their importance in the food cycle in fresh and marine waters. Knowledge of life cycles is a necessary preliminary to conservation of crustaceans used as food. Much research centers on crustacean hormones since the discovery in 1928 that color changes in certain crustaceans are controlled by hormones produced in the eyestalks, found to contain two glands. The colors of such animals are vested in pigment cells and hormonal control of degree of expansion and contraction of these cells determines the color, which can alter with background, and also often shows a day-and-night rhythm. Hormones are also concerned in molting. See also BARNACLE; CRAB; FISH LICE; HERMIT CRABS; LOBSTER, SHRIMP.

L. H. HYMAN,

Department of Lower Invertebrates, American Museum of Natural History.

CRUTCHED FRIARS (also called **CROSSED FRIARS**; **FRATRES CRUCIFERI**), an order of mendicant friars of the Middle Ages. They claimed to have been founded in the East by St. Anacletus in the 1st century; but they are known historically only from 1169, when Pope Alexander III prescribed a rule for them similar to that of the Augustinians. Their habit was brown or black, with a cross of red cloth, and they carried wooden staves that had crosses at the top—circumstances which gave them their name. In the 15th century Pope Pius II changed the color of their habit to blue and prescribed a small silver cross for the large wooden one they had carried.

At one time the order is said to have had 208 houses in Italy, headed by the priory of Santa Maria di Morella at Bologna, which was made their chief house by Pope Clement IV (r. 1265–1268). In 1244 this house had sent a contingent to England, where a house was founded in the next year, probably at Colchester or Reigate. In 1249 they formed a house at London, near Tower Hill in a section long called Crutch Friars, and some six or seven other English houses were eventually founded. Later various abuses crept in, and there were only 50 houses or fewer in 1656, when the order was suppressed by Pope Alexander VII.

A similar order of friars, also called **Frates Cruciferi**, existed in the Low Countries and France from the 13th century to the French Revolution. The habit of these friars was black, with a red cross. Other **Frates Cruciferi** existed in Bohemia in the 13th century and still others are said to have lived in Ireland.

CRUVEILHIER, krü'vā'li-ā', Jean, French anatomist: b. Limoges, France, Feb. 9, 1791; d. Jussac, March 6, 1874. He obtained in 1824 the chair of pathological anatomy in Montpellier and in 1826 in Paris. He published an important work *Essai sur l'anatomie pathologique en général* (1816). His other works include *Anatomie Descriptive*, 3 vols. (1833–1838); *Anatomie du système nerveux de l'homme* (1845); and *Traité d'anatomie pathologique générale* (1849–1864).

CRUX or SOUTHERN CROSS, in *astronomy*, a constellation of the southern hemisphere, composed of four stars, one of which is of the first and two of the second magnitude. They form a figure not unlike a cross, especially when seen above the pole, and are the best-known of the southern constellations.

CRUZ, SAN Juan de la. See JOHN OF THE CROSS, SAINT.

CRUZ, krōōs, Juana Inés de la, Mexican poet nun: b. Nepantla, Nov. 12, 1651; d. April 12, 1695. Author of three volumes of poetry, drama, and prose, published by her admirers in Spain, she was undoubtedly the greatest woman Spanish America produced during the colonial period with the exception of St. Rose of Lima. A contemporary of Anne Bradstreet, like the New England poetess, Sor Juana (Sister Jane) was known to the people of her time as the Tenth Muse. She wrote some beautiful sonnets and *liras*, but is chiefly remembered for her *Redondillas*, a poem castigating men for their unfair treatment of women. This has won her the name of the first feminist of Spanish America. In a letter to the bishop of Puebla, *Respuesta a Sor Filotea de la Cruz* (1691), Sor Juana told much about her life and advocated education for women. Born Juana de Asbaje, from early youth she craved an education and at the age of eight begged to be sent to the University of Mexico. She was sent to Mexico City, but wide reading took the place of formal schooling. She was given a post in the viceroy's court. This social success did not satisfy her, however, and she retired to a convent for her devotion to learning, two years before her death she gave up her books and studies. When a plague invaded her convent, she nursed the stricken nuns and died of the contagion. Her works, published in Madrid, include *Inundación castálida* (1689); *Poesias* (1691); *Obras póstumas* (1700).

CRUZ, krōōth, Ramón de la (in full RAMÓN FRANCISCO DE LA CRUZ CANO Y OLMEDILLA), Spanish dramatist: b. Madrid, Spain, March 28, 1731; d. there, March 5, 1794. He produced some 500 pieces in all departments of dramatic composition—classical drama, comedy, farce, *sarsuela* (musical comedy), and a mixture of classical drama, more especially of the French school. He also translated and adapted plays from Italian and French. So prolific was he, so devotedly did he work, and so endless were his literary and dramatic resources, that he has been called the Lope de Vega of the 18th century. He worked for all the theaters of Madrid; and often a week or less sufficed him to write a play or *sarsuela*. This work he kept up constantly for 30 years. Nineteenth century critics were inclined to belittle his work; but modern historians of the theater are finding in his dramas the mirror held up to the Spanish life of the 18th century, and they are beginning to understand what de la Cruz meant when he said of himself: "Truth dictates and I write"; for his works are a vast and rich treasury of information relating to the life and customs of the age in which he lived and which he knew thoroughly. In rescuing Spanish drama from foreign influence and in developing the *sarsuela*, and the *sainete* (one-act farce) and other short and characteristically Spanish plays,

he led the way for the modern renaissance of the Spanish drama.

(Consult Cotarelo y Mori, *Ramón de la Cruz y sus obras* (Madrid 1899).)

CRUZ Y GOYENECHE, krōōs ê gō-yā-nā'chā, Luis de la, Chilean military officer: b. Concepción, Chile, Aug. 25, 1768; d. near Val paraíso, Oct. 14, 1828. He explored the Andes in 1806, discovering several important mountain passes, which are described in a report published in the Angelis collection at Buenos Aires in 1835. He bore a leading part in the revolution against Spain, commanding a regiment and falling into the hands of the enemy, but was liberated in 1817. He next became a political leader of the young republic, serving for a time as acting president of Chile. He was invested by Peru with the dignity of grand marshal. Shortly before his death he was appointed minister of marine.

CRYOLITE, a double fluoride of aluminum and sodium, $3\text{NaF} \cdot \text{AlF}_3$, occurs in commercial quantity and is mined at only one place, Ivigtut, Greenland. This comparatively rare mineral is colorless when pure and crystallizes in the monoclinic system. It has a hardness of 2.5, and a specific gravity of 2.96. The mineral fuses at 950°C . with practically no loss in firing. Cryolite is found in commercially unimportant sources in the St. Peter's Dome district, Colorado; at Miasik, in the Urals; and in Canada. Synthetic cryolite was manufactured in the United States in 1950 by the Aluminum Ore Co. at East St. Louis, Ill., and the Reynolds Metals Co. at Bauxite (Hurricane Creek), Ark. The mine at Ivigtut, Greenland, is owned by the Danish state, and the mining concession is exploited by the Kryolitselskabet Oresund A/D of Copenhagen. The crude ore output is normally divided about equally between the Pennsylvania Salt Manufacturing Co. of Philadelphia, and the Danish company's manufacturing plant in Copenhagen.

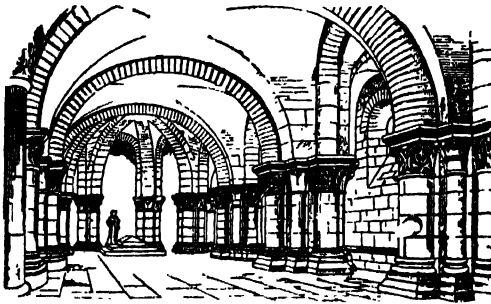
The crude ore which contains many impurities is converted into various manufactured products. One product from the processing plant is a white powder containing 99.4 per cent natural cryolite that is used in the aluminum industry, where it acts as the electrolyte in reducing alumina to metal. Synthetic cryolite made from fluorspar is used extensively for the same purpose, but has some disadvantages. A high quality cryolite product is used in the enamel and glass industry. It gives whiteness to enamel and is an opacifier in glass. Small tonnages are used as a binder for some abrasives and also as an insulating material having special dielectric properties. Another product is used as an insecticide.

Imports of natural and artificial cryolite into the United States in 1950 were 15,298 long tons valued at \$978,175, all from Greenland with the exception of 98 tons from Belgium; exports from the United States in the same year were 1,850 long tons, valued at \$404,931.

ALVIN S. COHAN.

CRYPT, krīpt, in architecture, a cell or vault constructed underground. The galleries of the catacombs and the catacombs themselves were known by this name in the early Christian era. The underground tombs of the Christian martyrs were so called where the early Christians met to perform their devotions, for fear of persecution. Hence crypt came to signify a church under-

ground, or the lower story of a church, which may be set apart for monumental purposes, or used as a chapel. It came to occupy the entire space under the choir; and often the part of the church above it was elevated and approached by flights of stairs, in order to give height to the crypt. The crypt is not common in churches built after the Norman period and when found in those of the Gothic period is usually much older than the structure above them. The position of a



Crypt of St. Eutropius at Saintes, France.

crypt is generally beneath the choir, but occasionally, as at Glasgow Cathedral, beneath the transept also. The largest crypt in England is that at Canterbury Cathedral. Crypts rarely occur as a feature of a parish church. The larger crypt at Glasgow Cathedral is entirely above ground and at one time was used by itself as a church. In Germany, these underground chapels are numerous—the ones at Gottingen, and Naumberg are fine examples of architecture. The most remarkable crypt in Italy is that of St. Mark's, Venice,



Decoration of crypt in catacomb of Praetextatus, 3d century.

which is in the shape of a Greek cross. Short columns support low arches on which the floor above rests. Other Italian crypts are at Brescia, Fiesole, Modena, Milan, Pavia, Verona, Florence; and a particularly fine one at Assisi. A good example of Norman crypt is to be seen at the church of the Holy Trinity at Caen, France. In the latter country there are notable crypts at St. Chapelle, Paris, at St. Gervase, Rouen, and the cathedral at Strasbourg. Later churches abolished the necessity for this form of chapel.

CRYPTOBRANCHIDAE, krīp'tō-brān'kī-dē (Gr. "of the family of hidden gills"), a family of aquatic urodele Amphibia (q.v.), represented today in Japan and China and the eastern United

States, but represented by fossils in the Miocene of Europe and the Pliocene of western North America. They appear to be closely related to the Asiatic salamanders of the family Hynobiidae, a family including the most primitive known Urodela. The Hynobiidae and Cryptobranchidae together differ from the salamanders in the external fertilization of the eggs, with the consequent absence in the male of specialized glands for the secretion of a spermatophore, and absence in the female of a sperm-receiving and storing sac. In their skeletons they also differ from other salamanders in the absence of an ethmoid bone, incompleteness of the bony partition between inner ear and brain and freedom of the angular bone. The Cryptobranchidae differ from the Hynobiidae in the absence of a lacrymal bone and in retaining larval characters throughout life.

There are two genera: *Megalobatrachus* (without gill opening in adult) from China and Japan, and *Cryptobranchus* (with one gill opening) from the eastern United States. They are the largest known salamanders, *Megalobatrachus* reaching a length of over five feet, though *Cryptobranchus* does not exceed 27 inches. See HELL-BENDER.

CRYPTO-CALVINISTS, krīp'to kāl'vīn-ists, name given to Melancthon and those who agreed with him in wishing to unite the Lutherans and Calvinists, and especially in his supposed leaning toward the Calvinistic view of the Lord's Supper as shown in the difference between the original and the altered Augsburg Confession (q.v.). The former said "The body and blood of Christ are truly present in the Lord's Supper in the form of bread and wine and are there distributed and received by the communicant; therefore the opposite doctrine is rejected." In the latter the last clause is omitted. Luther did not approve the alteration, but tolerated Melancthon's change of doctrine. Many, however, called him a Crypto-Calvinist. The truth seems to have been that he did not consider that either opinion was a sufficient bar to communion with Christ and therefore thought that both of them ought to be allowed. The controversy was becoming violent before his death, but afterward it broke out with great virulence, and continued with alternate success for 50 years, during which time frequent attempts were made to suppress the Calvinistic opinions by imprisoning their leading advocates and at last, in 1611, by the execution of Chancellor Nicolas Crell. The term has also been applied to the Missouri Lutherans because of their acceptance of the doctrine of unconditional election.

CRYPTOGAMOUS PLANTS or **CRYPTOGAMS** (from Greek *kryptos*, hidden and *gamos*, marriage) are plants bearing reproductive organs other than flowers. They include algae, fungi, lichens, mosses and liverworts, and ferns and fern allies. The latter (ferns and fern allies) are often called *vascular cryptogams*. Plants bearing flowers are known as *phanerogams*. These designations, dating from Linnaeus, have long lost their scientific meaning but are retained as terms of convenience.

CRYPTOGRAPHY. (Gr. *kryptos* hidden and *graphein* to write), the art of the composition and solution of methods of secret communication.

Methods.—The basic methods by which secrecy of communication may be obtained are: (1) *Code*—a secret language; (2) *Cipher*—ordinary language specially written (this may be done in two ways: *substitution cipher*, or the use of a private alphabet; and *transposition cipher*, in which the order of the letters or the words of the message is scrambled according to an agreed system so that it can be restored by the recipient); (3) *Concealment*—by such methods as invisible ink or by disguising the message as something else, such as a sheet of music. These methods may be used singly or in combination (See also CIPHER AND CODE WRITING.)

Characteristics.—A practically useful cryptographic system must possess the following characteristics:

(1) It must not be so complicated or require the use of such apparatus that it cannot be handled by the person required to use it in the circumstances in which he is placed. A system suitable for diplomatic cables would be useless to a soldier in a foxhole.

(2) It must not be so constructed that a single mistake in composition or in transmission makes nonsense of the remainder of the message.

(3) It must not be possible to extract more than one meaning from the message.

Obvious though these points may appear, systems of insoluble cipher (which do exist) generally fall foul of one or more of them. In selecting the system to be used the guiding rule is to choose the simplest which will defy solution until the information contained in it is of negligible value to an unauthorized reader.

Nomenclature.—As with other arts, there are a few technical terms which need explanation, apart from those defined above. The *clear* is the communication to be made. The *message* or *cryptogram* is the communication after it has been written in code or in cipher. A *group* is either a word in code language (which may stand for a complete phrase of the clear) or an arbitrary grouping of cipher letters or symbols for convenience of transmission or of checking. Natural word divisions are avoided in cipher work, as they make the cryptogram easier to break. To *break* a cryptogram is to reconstruct the code or cipher system by which it was written, the process by which it is broken being called *cryptanalysis*. A *null* is a meaningless word or letter. Other terms will be defined as they arise in the text.

Code.—It is probable that code was the earliest cryptographic method. A husband and wife speaking in a language which their children do not understand are using code. This elementary form of code has two major defects: there is no

positive guarantee that others may not understand, and words employed to describe the subjects discussed may not exist in the language used.

For these reasons artificial languages tailored to suit their intended use are normally employed. The earlier examples, such as the "thieves' cant" of the Middle Ages, were of normal construction, but with special words to replace those of ordinary speech; and were learned by heart by their users with no more difficulty than that of learning any other language. Be-bop slang is of this kind. Modern codes, however, are constructed so that one word or group may stand for an entire phrase or sentence. A well-known example is the International Code group SOS, meaning I AM IN DANGER AND NEED IMMEDIATE HELP. Because of this condensed structure and because the groups are not necessarily pronounceable, it is not practicable to learn modern codes by heart, so that code books, dictionaries of the code language, must be used. A portion of one of these books is shown in Fig. 1.

Varieties.—A code in which both the groups and their meanings are arranged in alphabetical or numerical order is called a *one-part code*. A *two-part code* or *random code* has no relation between the order of the groups and that of their plain language equivalents, so that a book listing the meanings in order, with their equivalent groups, is needed for coding, and another, listing the groups in order, with their equivalent meanings, is required for decoding. A one-part code is easier to compose and to handle and is therefore used for commercial codes in which condensation rather than secrecy is the primary objective, but its orderly construction makes it relatively easy to break, so that random codes are preferred for secret work.

It will be noticed that the groups of one of the codes shown in Fig. 1 are constructed of letters and those of the other of numerals. For commercial codes letter groups are practically universal, but for secret work numeral groups are preferred because they lend themselves better to subsequent ciphering (see section on *Ciphered Code*).

Until 1932 commercial code groups were required by international telegraph regulations to be pronounceable words, but modern practice is to use groups of five letters. These are so arranged that the accidental transposition of two letters or a mistake in one letter will produce a meaningless "corrupt group" rather than an incorrect reading. Take for example the group ABAOY of Fig. 1. ABABY, AABOY, and ABAYO are all meaningless, as is any other group differing from ABAOY by a single letter

One-part letter code		Two-part (random) figure code	
ABALC	Abandon(s) (ing)	53827	Abandon(s) (ing)
ABADM	To abandon	47534	To abandon
ABAEN	They will abandon	39682	They will abandon
ABahr	Abandoned	73593	Abandoned
ABAOY	Abandonment	54481	Abandonment
ABARA	Abated	27496	Abated
		01136	Will dispute
		01142	Cancel
		01151	Sail(s) (ing)
		01168	Harbor dues
		01175	Calm
		01184	Fuel

Fig. 1. Types of code book.

or by the transposition of two adjacent letters. Similar safeguards are provided in numeral codes.

A one-part code composed by enumerating words from a dictionary by page and line is called a *dictionary code*. This is easily broken, because in any dictionary of similar size and make-up to that used to form the code the same words will fall in approximately the same positions. If an ordinary book is used, a much more resistant random code is produced, but the difficulty of locating the desired words, when coding, is usually so great that the code is practically useless.

A special type of code is that designed to pass information while preserving the appearance of an innocent message. A telegram reading TELL UNCLE TO COME AT ONCE MOTHER SINKING FAST might pass without comment, even in wartime, but if UNCLE is the code group for ALL SUBMARINES IN AREA, MOTHER means CONVOY OF OVER 50 SHIPS, and SINKING FAST equals SAILING WITHIN 48 HOURS, the telegram acquires a different complexion. The difficulty with this type of code is to detect its presence; once identified, it is seldom hard to break. It may sometimes be detected due to unnatural wording of the message, but more frequently because the sender or the addressee are persons on whom suspicion has fallen for other reasons. For other developments of code see the section *Ciphered Code*.

Solution.—Codes are more frequently compromised by carelessness, betrayal, or capture than by the efforts of the cryptanalyst, but they may be broken by essentially the same method as is used by someone thrown among uncooperative foreigners to learn their language. If a commercial agent dispatches a cargo of potash when, and only when, he receives a message from his principal containing the group EEVAL and receives potash whenever he sends a message containing the same group, it becomes practically certain that EEVAL has some connection with potash.

This method of attacking a code is known as the "probable word" technique. It may be applied also to ciphers and, in the proper hands, is extremely powerful, but its consistently successful application seems to require an intuitive gift possessed by a minority of individuals. The extremely stereotyped wording of most diplomatic and military dispatches is a great help in this method of cryptanalysis.

Cipher.—When literacy was confined to a restricted class, usually of priests, any alphabet would be meaningless to almost everyone other than the intended recipient of the message. As soon as this ceased to be so, variations on the standard alphabet would be introduced to preserve the secrecy of a message, when required, such variant alphabets being ciphers in the normal modern sense of the word.

Transposition Cipher.—The earliest cipher

The clear HIDE AT ONCE A WARRANT IS OUT FOR YOU is here written in a 6 by 5 letter rectangle, filled out with a null P.

	1	2	3	4	5	6
1	H	I	D	E	A	T
2	O	N	C	E	A	W
3	A	R	R	A	N	T
4	I	S	O	U	T	F
5	O	R	Y	O	U	P

The encipherment may be performed by following any "route" through the figure, as:

- (1) Down column 5, up 3, down 1, up 6, down 2, up 4; giving AANTU YORCD HOAIO PFTWT INRSR OUAEE.
- (2) Round an anticlockwise spiral, beginning at line 1 column 3; DIHOA IORYO UPFTW TAE CN RSOUT NAERA.
- (3) Following the diagonals from left to right and downward, beginning at the top right hand corner; TAWEA TDENF ICATP HNRUU OROOA SYIRO.

Any other figure and any agreed route may be used. The figure may also be formed of complete words, one to each small square of the figure, and the words may be route transposed in a similar manner.

Fig. 2. Route transposition cipher.

The letters of each language listed are arranged in order of frequency of appearance. The percentage figure opposite each group of letters represents the approximate number of appearances of each letter of the group in 100 letters of normal text. The classification is fairly reliable for messages of 200 words or over in English or German, 500 for Spanish and French. If "the" is omitted from English text, T and H each drop into the group below.

English	French	Spanish	German
1—E	1—E	1—EA	1—E 17%
2—T	2—ASITN	2—OS	2—NI 8%
3—AONRIS	3—RULO	3—RNID	3—STRAD 6%
4—H	4—D	4—LCTU	4—HUG 4%
5—DLFCMU	5—CMP	5—MP	5—MCLB 3%
6—GYPWB	6—VQGBHJ	6—BGYVQHFZJX	6—OFK 2%
7—VKXJQZ	7—XY	7—KW negligible	7—WVZP 1%
	8—ZKW negligible		8—JQYX negligible

Fig. 3. Letter-frequency tables.

system of which we have a specific description is the *skytale* transposition cipher used by the Spartans about 450 B.C. A narrow belt was wound round a fairly thick rod (Gr. *skytale*) and the clear written on it, so that, when unwound, the belt appeared to be covered with a meaningless jumble of letters, which would then have attracted no more attention than would a woman's head scarf similarly decorated today. The recipient wound the belt round an identical rod to read the clear. This was an excellent system, combining a system of cipher with a method of concealment, but useless once the secret was known, as a suspicious belt needed only to be tried on different sizes of rod to break the message.

Route cipher: In most modern systems the transposition is performed on paper. The clear is written in the form of a rectangle or other geometrical figure and is ciphered by following an agreed route through the figure. One of the simplest forms of route cipher is the *rail fence*. The clear is written in two lines by alternate letters and is copied by following the horizontal lines. The clear HIDE AT ONCE A WARRANT IS OUT FOR YOU is written:

H D A O C A A R N I O T O Y U
I E T N E W R A T S U F R O

and is transcribed as HDAOC AARNI OTOYU IETNE WRATS UFROP. P is a null to complete the last group.

A more resistant cipher is produced by writing the clear in the form of a more or less equal-sided rectangle and following any convenient route to form the cipher message. See Fig. 2.

To break a transposition cipher it is first identified as such by the fact that the frequency of letter occurrence is normal for the language used. Fig. 3 gives letter-frequency tables for English, German, French, and Spanish. The usual method of solution is to reconstitute the original figure, a rectangle in the vast majority of cases. Taking the message of Fig. 2 (2), DIHOA IORYO UPFTW TAE CN RSOUT NAERA, there are 30 letters, which may be factorized as 2 by 3 by 5. The rail fence, or 15 by 2 rectangle, is easily checked and rejected. Of the other possible rectangles 6 letters by 5 and 5 by 6 are the most likely. As the most common route follows the vertical columns in some irregular order, the message is arranged vertically in columns of 5 letters.

D I U T R N
I O P A S A
H R F E O E
O Y T C U R
A O W N T A

Shuffling the columns, in their existing vertical order or reversed, gives no sensible reading from the horizontal lines, so that some other route or some other figure has been used. Other figures giving no better success, the message is re-examined. The high-frequency combinations of low-frequency letters YOU and OUT may well be part of the clear, in which case part of the message has been routed in the same direction as that in which the clear had been written—which leads to the possibility that some other part of the message may be the clear reversed. The examination of this possibility shows the fairly rare but pronounceable HID in the first group. HID.

YOU, OUT are thus probable portions of the horizontal lines of the assumed rectangular figure. HID cannot be extended at all in one direction and in the other gives most unlikely combinations. It is therefore possible that the route started in the middle of a horizontal line and then changed direction. Following the outline of a 6 by 5 letter rectangle gives

H I D
O
A
I
O R Y O U

This picks up with the YOU combination already assumed to be part of a horizontal line; continuation of the spiral thus indicated will reconstitute the original rectangle. This analysis has been given in some detail, for it demonstrates the basic method of solution of a route cipher.

Double transposition cipher: This is a form of route cipher in which the clear is written and is ciphered by the method described in the preceding section; the resulting message is transposed again by using the same or a different route and figure. It is more difficult to solve than a simple transposition cipher, but it will yield eventually to analysis, since there is only a limited number of practicable figures and routes and each, if necessary, can be tried in turn.

Cardan grill: This is a method more akin to the Spartan belt cipher. The words or letters of the clear are written through irregularly spaced holes in a sheet of paper or card (the grill), which is then removed and the message sheet is filled up with nulls. This can be very difficult to break, but the requirements that both sender and receiver must have identical grills and that either the actual piece of paper on which the message is written by the sender or an exact facsimile must be used for the decipherment are often difficult to fulfil. Variants of the Cardan cipher in which, for example, the third word after each comma gives the true clear, are difficult to compose and are rarely hard to break. In any kind of Cardan cipher the message is much longer than the clear—another disadvantage.

The Cardan grill is sometimes used to produce what is in effect a particularly complicated route cipher. Using a grill in which the holes are so spaced that words or letters can be written through the holes, the grill rotated 90° about its center and more of the clear written through without interference with those already written, then rotated 90° again; this continues until after the third rotation the message sheet is covered with evenly spaced words or letters (filled with nulls, if necessary) and a message is produced which is not much, if at all, longer than the clear and which can be taken off in groups for transmission.

Used alone, transposition cipher will rarely do more than delay decipherment. Its chief use is in two-step cipher (discussed later).

Substitution Cipher.—Substitution ciphers are first mentioned by Roman writers of the 1st century A.D. as having been used in the time of Julius Caesar (c.50 B.C.); but, since several alphabets were in use in the ancient world, it may have been used very much earlier, for any message written in one language with the letters appropriate to another, for example Latin written in Greek letters, is a substitution cipher.

Simple substitution: In this cipher each letter of the clear is replaced by some other letter or symbol, any cipher symbol always representing the same letter of the clear. In the early Roman or Julian cipher each letter of the clear is replaced by the one falling an agreed number of places earlier or later in the normal alphabetical order. Thus CAT may be ciphered as ECV by replacing each letter with that two places later.

A commoner method is to write out the alphabet with another in irregular order below it:—

Clear letters A B C D E F G H I J K L M
Cipher letters C H I N R E S T A B D F G

Clear letters N O P Q R S T U V W X Y Z
Cipher letters J K L M O P Q U V W X Y Z

This shows the most usual method of producing a disordered alphabet, by putting down a "key word," omitting repeated letters, if any, then the remaining letters of the alphabet in direct or reversed order.

As the method of breaking a simple substitution cipher is basic to the solution of substitution ciphers in general, a worked example is given.

The message is:

1	2	3	4	5
YOCIL	HROQE	OPCPQ	PCKJS	CLBRN
6	7	8	9	10
OBKQH	TLNRO	RJPJK	TCDDC	SQHPX
11	12	13	14	15
PKPBR	HRVOP	RWLNR	CRJSR	TSNXL
16	17			
PKANY	LBRNA.			

A frequency count, always the first step, gives R—11 appearances, P—8, C—7, N, O, L—6, K—5, H, B, J, Q, S—4, T, Y—3, A, D, X—2, E, I, W—1. Although the frequency tables are unreliable in such a short message, the marked frequency of R justifies the tentative assignment R = E. In groups 3—4 the "pattern" series PCPQPC stands out. In English this almost certainly represents TITUTI or ONOTON. The high frequency of P in the message encourages the selection of TITUTI, which may confidently be expanded to TITUTION. Assignment of these values in the message gives:

1	2	3	4	5
YOCIL	HROQE	OPCPQ	PCKJS	CLBRN
SI	ESU	STITU	TION	I E
6	7	8	9	10
OBKQH	TLNRO	RJPJK	TCDDC	SQHPX
S OU	ES	ENTNO	I I	U T
11	12	13	14	15
PKPBR	HRVOP	RWLNR	CRJSR	TSNXL
TOT E	E T E	E IEN	E	
16	17			
PKANY	LBRNA.			
TO	E			

There are no unlikely combinations, and the analysis may be proceeded with. DD appears once (in group 9); the commonly doubled letters in the English language are EE, OO, FF, LL, SS, TT, MM, PP. Eliminating those already identified leaves IFFI, ILLI, IMMI, IPPI, of

which the last three are practically always followed by NG or, in the case of ILLI, ON. IFFI, on the other hand, generally appears in the word DIFFICULT. IEN-E (in group 14) calls for S = C, which confirms this deduction. ESEN is usually preceded by R, and N = R is confirmed by its association with R = E and by its general frequency. The substitution of these equivalents practically completes the decipherment:

1	2	3	4	5
YOCIL	HROQE	OPCPQ	PCKJS	CLBRN
SI	LESU	STITU	TION	I ER
6	7	8	9	10
OBKQH	TLNRO	RJPJK	TCDDC	SQHPX
S OUL	D RES	ENTNO	DIFFI	CULT
11	12	13	14	15
PKPBR	HRVOP	RWLNR	CRJSR	TSNXL
TOT E	LE ST E	ER	IENCE	CR
16	17			
PKANY	LBRNA.			
TO R	ER			

This solves readily to A SIMPLE SUBSTITUTION CIPHER SHOULD PRESENT NO DIFFICULTY TO THE LEAST EXPERIENCED CRYPTOGRAPHER, with a null to fill the last group. The cipher alphabet has been composed by using the key word YESTERDAY, or "yesterday," omitting repeated letters.

Simple substitution with suppression of frequencies: This is a variant of the simple substitution cipher in which several equivalents are provided for the commoner, or all, letters. An example of the type is that in which A may be represented by any number between 1 and 9, B by any number between 10 and 19, and so on. It is not very much more secure than ordinary simple substitution, as in any reasonably large accumulation of material commonly repeated words or letter combinations will tend to be ciphered by an almost identical series of symbols several times, allowing tables of equivalent symbols to be constructed. The cipher then reverts to a simple substitution.

Syllabic: This is a substitution cipher in which the symbols represent syllables instead of single letters. Its characteristics are intermediate between those of a letter cipher and of a code. A cipher of this type, known as the Great Cipher of Louis XIV, was used by the French government during the late 17th and the early 18th centuries. It was regarded as unbreakable at the time of its introduction, but was solved without too much trouble during the 19th century by essentially the same methods as those used for a letter substitution cipher, with a table of syllabic instead of letter frequencies. As it has all the disadvantages of a code with neither its security nor its condensation, syllabic cipher is little used today.

Polyalphabetic or double substitution cipher: A great improvement in security is obtained by the use of this type of substitution cipher, in which a different cipher alphabet is used to encipher each successive letter of the clear. This not only produces a cryptogram in which all the letters have an approximately equal frequency, but also prevents the cryptanalyst from picking "patterns" and other letter combinations which may give a lead to the recognition of "probable

ABCDEFGHIJKLMNOPQRSTUVWXYZ
 ABCDEFGHIJKLMNOPQRSTUVWXYZABCDEFGHIJKLMNOPQRSTUVWXYZ
 AZYXWVUTSRQPONMLKJIHGFEDCB

Fig. 6. St. Cyr rule. As shown, the rule is constructed for encipherment using the key letter N. The result is identical with that obtained by using the Vigenère table. See Fig. 4.

bets printed round the edge (Fig. 8). The disks may be rotated independently round the center spindle and locked together if desired. The disks are rotated to align the letters of the first section of the clear and any other line of letters read off to form the message, and the process is repeated with the next section of the clear. If the same alphabet is used on each disk, the result is a series of simple substitutions changing every 25 or 26 letters; if each disk carries a different alphabet, the result is practically a Vigenère with a disordered table and a long random key.

Modern ciphering machines are essentially electric typewriters or teleprinters with a "cipher drum" in the internal electric circuit. When a letter key is pressed, the cipher-drum circuits cause some other letter to be printed on the paper. After each letter the drum turns, producing a different mix-up of the circuits when the next key is pressed. The effect, again, is that of a Vigenère with a disordered table and a long random key. The message is deciphered by typing

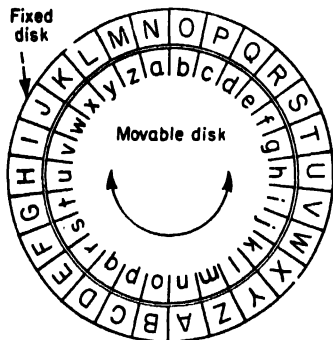


Fig. 7. Cipher disk. This device is a variant of the St Cyr rule (Fig. 6), in which the fixed disk replaces the stock and the movable disk replaces the slide. It is shown set up for ciphering with the key letter N.

it on a similar machine which reverses the action of the cipher drum and prints the clear. Where the necessary power is available and their weight and bulk can be accepted, as in naval and diplomatic service, these machines are very useful and are both faster and more accurate than conventional ciphering methods. A disadvantage for some purposes is that it is not easy to destroy a cipher drum, which contains the key to the cipher, sufficiently to prevent its circuits from being analyzed.

Machines used in cryptanalysis are mostly Hollerith type tabulating machines which, once set up, can analyze a message for repeated letter combinations, count frequencies, try out "probable words," and perform similar mechanical processes faster and more accurately than is possible with pencil and paper.

Concealment.—This is the art of concealing the existence of a communication. Its chief use is in espionage.

"Hiding" Methods.—These are typified by

the device of sticking the stamp over a short message written on the outside of an envelope. A method of this kind, used by the Germans during World War II, employed a technique that enabled the photographic negative of a sheet of typescript to be reduced in size to such an extent that it could be stuck over the period dot in a typewritten letter. The recipient would examine each dot under a microscope, scrape off the speck of gelatin, and enlarge it to produce a legible print. This technical triumph was made ineffective by a United States intelligence agent who picked up a hint of the nature of the method before it was ever used in practice, so that postal censorship detected the micro-dot negatives as soon as they appeared.

Invisible Inks.—These are liquids, normally colorless, which become colored and therefore visible on white paper when treated in some manner. Letters written with many fruit and vegetable juices, milk, alum solution, saliva, and several other liquids, will darken and become

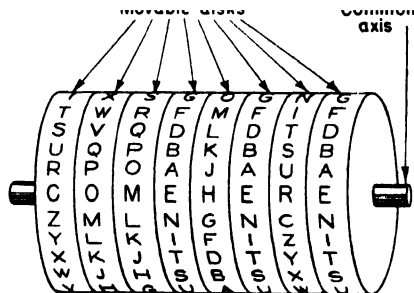


Fig. 8. Bazeries cylinder. This illustration is diagrammatic and shows the principle only. 25 or 26 disks are normally provided. The disks are rotated until the letters of the clear are lined up (COME HERE in the figure) and then locked. Any other line of letters (as YLKIFIZI) may be chosen as the cipher message for transmission.

visible on exposure to heat. Heat-developed inks such as these have been used for over 2,000 years. Inks made legible by other means than heat exist, some, such as quinine solution, fluoresce under ultraviolet light, starch solution turns blue on exposure to iodine vapor, cobalt nitrate is developed by brushing a weak oxalic acid solution over it, and a wide range of other chemical reactions may be employed. Invisible ink is generally used to write messages over some innocent cover, such as a harmless letter or the page of a book or periodical. A soft pen or very fine brush must be used to avoid scratching the surface of the paper, which must not be too highly glazed—otherwise it will be discolored where it has been wetted by the ink. It is in any case extremely difficult to avoid making some visible mark on the paper whatever the ink and method of writing employed. Successive exposure of a suspected paper to heat, iodine vapor, and ultraviolet light will expose all the commonly used inks.

Methods of Disguise.—This technique of concealment leaves the message visible, but under such a form that it is not readily recognisable as a communication. Codes designed so that the message appears to have an innocent surface meaning have been discussed earlier, and a system of cipher invented by Johannes Trithemius exists which is designed in a similar manner. This cipher is a simple substitution with suppression of frequencies in which each letter of the clear may be represented by any one of a list of words, a sufficient choice being available for each letter that a reasonable connected surface narrative can be created. In practice this cipher is so cumbersome as to be almost useless.

There are also those ciphers, such as the Spartan transposition written on a belt, which do not look like messages at all. One such, greatly loved by fiction writers, is the cipher in which a note of music (written, played, or even sung) represents a letter of the alphabet. Quite apart from the difficulties of using such a cipher "by ear," it is practically impossible to make a playable melody from the letters of any but a specially selected clear. More feasible is the use of a numeral cipher written into the form of a calculation, with the answers regarded as nulls.

Most concealed ciphers are of the *bilateral* type, in which the letters are represented by a combination of two symbols, as in the Morse code. Any two symbols may be used, such as mixed fonts of type, alternating colors in the lettering of a poster, or whatever apparently innocent combination that ingenuity may devise. A very subtle application of the bilateral cipher, used successfully by a group of anarchists plotting the assassination of the Czar Alexander II, consisted of a fairly difficult double transposition cipher covering a relatively innocuous clear, handwritten in 5-letter groups. The real message was written in a bilateral cipher, of which one symbol was a group of the cover message in which the pen had been lifted between two letters and the other a group written without lifting the pen. The secret police were so intent on the analysis of the transposition cipher message that they never noticed the presence of the bilateral cipher.

If successful, concealment methods are superior to any other, since no higher degree of security can be imagined than complete ignorance on the part of all except the intended recipient that any message exists to be read; but the secret may always be betrayed by espionage, carelessness, or chance, and, once known to anyone not completely trustworthy, no concealment method can be regarded as safe.

History.—From the nature of the subject the history of cryptography is not well documented. Considerations of military and political security have usually ensured that the professional cryptographer does not publish anything not already common knowledge, so that more than in any other art the major contributions to the literature of the subject have come from amateurs.

There are a few references to ciphers in the works of late classical writers such as Plutarch and Suetonius (both fl. 100 A.D.), but for the next thousand years cryptography appears to have been practically a lost art. In view of the general illiteracy of the period this is hardly surprising. The English friar Roger Bacon (1214?–1294) described several cipher systems of a fairly elementary nature, but, as in the case of several other writers on cryptography, his actual knowl-

edge of the subject seems to have been greater than might be assumed from his published work, because a complete book attributed to his authorship exists, written in a cipher which never has been broken. It appears to be a multistep cipher, so complicated that it is possible that it is in effect a difficult form of double substitution with transposition. It may also be a ciphered code or even an elaborate joke.

A hundred years after Bacon's death cryptography had become well enough established to justify the employment of professional cryptographers by European governments. A copy still exists of a manual (*Liber Ziferarum*) written by Gabriele di Lavinde, chief cryptographer to the papal curia about 1380. This gives instructions for the breaking of simple substitution ciphers that show that the cryptanalysts of the period could handle them as readily as those of today.

A later professional handbook, *Regulae ad Extrahendum Litteras Ziferatas sine Exemplo*, written about 1475 by Cicco Simonetta (1410–1480), cryptographer of the duchy of Milan, recommends the use of code ciphered by simple substitution with suppression of frequencies, which argues that a very high level of skill in cryptanalysis had been attained by this time.

The year 1518 saw the publication of the first reasonably comprehensive book on cryptography written for general publication. This was the *Polygraphia* of the German abbot Johannes Trithemius (1462–1516), which describes both substitution and transposition cipher systems, including the above-described Trithemius substitution cipher, and suggests methods of solution.

The first description of a double substitution cipher is found in the *De Furtivis Litterarum Notis* of the Neapolitan mathematician Giovanni Battista della Porta (1535–1615), published in 1563; but Porta's cipher was never adopted by professional cryptographers and was soon largely forgotten. The same fate attended the improved system advanced by the French diplomat Blaise de Vigenère (1523–1596) in his *Traité des Chiffres* (1586), which lay neglected for nearly a century after its publication.

Francis Bacon (1561–1626), like his earlier namesake Roger Bacon, included descriptions of cipher systems among his scientific and philosophical writings and appears to have been the inventor of bilateral cipher.

In 1627 Antoine de Rossignol was appointed head of the cryptographic department, or *Chambre Noire*, of the French government, a position which he held until his death in 1678. Rossignol is one of the great figures of cryptographic history, both as a very talented cryptanalyst and as the author of the already mentioned Great Cipher of Louis XIV. It is a little difficult to understand why Rossignol did not adopt the less cumbersome double substitution cipher, but it is possible that he distrusted the orderly formation of the Vigenère and it may be that he had anticipated the Kasiski method of solution. The Great Cipher was carefully devised to be quite unsystematic in its formation and existed in a number of forms, so that the breaking of the cipher used by one diplomat or general would not compromise messages from any other source.

Double substitution cipher was used to some extent in the German states during the late 17th century, but in general codes of a rather crude type were employed throughout northern Europe,

while the Mediterranean powers other than France continued to favor simple substitution with suppression of frequencies.

During the 18th century the practice of cryptography regressed steadily. In the American Revolution some attempt was made on the colonial side to employ double substitution cipher, but this was never seriously adopted. The British at this time favored a system of word transposition, while the French reverted to the use of straight simple substitution.

The invention of the semaphore telegraph (1792) and the introduction of flag signals for naval use sparked the development of the modern type of code, in which a single group may represent a complete phrase, and the commercial introduction of the electric telegraph (1844) gave it the final impetus.

Modern.—The next period of cryptographic development began about 1820. An article by William Blair (1766–1822) in the 1819 edition of *Rees's Cyclopaedia* gave methods of solution for various kinds of simple substitution cipher and described double substitution ciphers without being able to offer any very satisfactory method of attack. This article aroused considerable public interest in cryptography, and may have been responsible for turning the attention of Rear Admiral Sir Francis Beaufort (1774–1857), who devised the Beaufort cipher, to the subject.

In a series of articles published in *Graham's Magazine* during the early 1840's Edgar Allan Poe (1809–1849), a very talented cryptanalyst, demonstrated that no variant of the simple substitution cipher was capable of resisting solution for very long in a message of reasonable length.

By 1850 double substitution or route transposition ciphers were used in all serious work. The British scientist Sir Charles Wheatstone (1802–1875) devised the Playfair cipher about 1860, but this remained unused until its introduction into the British Army 50 years later.

In the United States the Civil War found the South using the Vigenère cipher and the North a simple word transposition. The Northern cryptographers did a very good job of breaking the Southern ciphers. Since the Kasiski analysis was not known to them, they relied on "probable word" methods, helped by the cryptographically slovenly Southern habit of preserving the word divisions of the clear. The South displayed in general an almost incredible cryptographic ineptitude. Even though they had masses of material on which to work, they never succeeded in reading a Northern cryptogram except when they captured a cipher book, and, whenever this happened, a relatively minor change in the routing of the transposition was enough to re-establish the security of the cipher.

In 1863 a Major F. W. Kasiski of the Prussian General Staff published the Kasiski method of analysis of double substitution cipher, which was followed 20 years later by the Kerckhoffs technique for extraction of the key word, and a few years after that by the method of mathematical coordinates. These methods are all fairly reliable when properly handled, but are inclined to be slow and arduous when applied to complex ciphers.

In 1899 Commandant Étienne Bazeries, then head of the French cryptographic bureau, was faced with a series of Vigenère cryptograms composed with a disordered table and a long key, a poem by Alfred de Musset. These cryptograms,

which emanated from a royalist group plotting a rising against the republic, were broken in a remarkably short time by the brilliant application of "probable word" methods, which were fully described at the trial of the conspirators. This demonstration of the power of the "probable word" technique has affected all cryptographic practice since that time, though it is probable that the increased availability of machines which remove much of the drudgery of the more rigid methods of analysis will increase their popularity for the solution of systematically constructed ciphers. For codes and unsystematic ciphers, however, the "probable word" remains the most consistently profitable method of attack.

World War I saw the general adoption of the Playfair cipher, introduced by the British, for military communications. Codes were regularly betrayed by espionage and by capture; and the breaking of new German ciphers was aided by their habit of broadcasting standard test messages in each cipher as it was introduced into service. Both sides regularly compromised new codes and ciphers by sending messages in the new form to isolated ships or units and then by having to repeat them in the old code or cipher because the addressee had not yet received the new one. As a result of these experiences ciphered codes have replaced straight codes for most applications where interception is probable, the cipher step being changed at regular intervals. The introduction of satisfactory types of electric ciphering machine has led to an increase in the popularity of the irregular double substitution cipher.

Bibliography.—Not very much on cryptography that is of interest to the serious student has been published recently in English and most of this is reported out of print, though the larger public libraries usually have a few works published since World War I. More serious literature on the subject exists in French than in any other language.

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PAUL D. HOBSON,
Lieutenant (E), Rtd., Royal Navy.

CRYPTOMERIA, krip-tō-mē'rī-à, a genus of tall (120 to 150 feet), hardy, evergreen, coniferous trees belonging to the Taxodium family (Taxodiaceae). Generally regarded as monotypic, the Japan cedar or "sugi" (*C. japonica*) is found growing wild in southeastern China and throughout Japan as far north as Hondo. The Chinese populations of this species are sometimes treated as a separate species. For centuries this picturesque species has been cultivated, especially in temple gardens of China and Japan and elsewhere, in a variety of horticultural forms since the beginning of the 19th century. The awl-shaped leaves, projecting from all sides of the twig, are bright green in spring and summer, and bronzy crimson in winter. The trees are monoecious. The cone scales, bearing a pair of erect seeds, are imbricate and spread at the tip.

CRYPTURI, *krip-tū'ri* (Gr. "hidden tail," because the tiny tail feathers are concealed by the surrounding feathers), an order of birds, often called Tinamiformes. In general appearance resembling quail or guinea fowl, the tinamous possess many anatomical peculiarities and are perhaps closest to the South American ostrich or rhea. Unlike the latter, however, they have a keel on the sternum and are capable of rapid, if briefly sustained, flight. The approximately 40 species of tinamous inhabit South America and North America north into Mexico; they are all placed in the single family Tinamidae. See TINAMOU.

CRYSTAL, village, Minnesota, in Hennepin County, a northwestern suburb of Minneapolis. Pop. (1950) 5,713.

CRYSTAL CITY, city, Missouri, in Jefferson County, 30 miles south of St. Louis, on the Mississippi River. It has a large plate-glass factory, and nearby are silica pits. Incorporated in 1911. Pop. (1950) 3,499.

CRYSTAL CITY, city, Texas, seat of Zavala County, in the southern section of the state. Crystal City is 95 miles southwest of San Antonio and 35 miles south of Uvalde. It is the shipping center of an irrigated area that grows winter vegetables, and is served by the Missouri Pacific Railroad. Canning is the principal industry. Pop. (1950) 7,198.

CRYSTAL FALLS, city, Michigan, and seat of Iron County, alt. 1,344 feet, near the Wisconsin line, 25 miles north of Milwaukee, on the Chicago and Northwestern and Chicago, Milwaukee, Saint Paul and Pacific railroads. It is a summer resort. Lumbering and iron mining are the chief industries. Under the charter of 1918 government is vested in a commission and city manager. Pop. (1950) 2,316.

CRYSTAL LAKE, city, Illinois, 45 miles northwest of Chicago; on the Chicago and Northwestern Railroad. Situated on the little Crystal Lake, so named by Beman Crandall who first settled on its banks in 1836, the city is a residential community. The adjoining communities of Crystal Lake and Nunda were incorporated as villages in 1874. They united in 1914, incorporating as the city of Crystal Lake. Government is by mayor and council. Pop. (1950) 4,826.

CRYSTAL PALACE, a building at Sydenham, England, about seven miles from London. The material in this building was at one time used in the Crystal Palace erected for the World's Fair which was held at Hyde Park, and was formally opened by Queen Victoria, Feb. 25, 1851. The original building was designed by Sir Joseph Paxton; the materials composing it were glass, iron, and wood. It cost £1,450,000, and every department of art and science was represented. Its area was nearly 21 acres. In 1854, when the building was about to be demolished, a company formed to purchase it tore down the original and removed the material to Sydenham in Kent. The new edifice was patterned after the World's Fair building. The grounds around the Crystal Palace were in area about 200 acres, and beautifully laid out. This palace was opened by Queen Victoria, June 10, 1854. It was de-

stroyed by fire in 1936. The name of Crystal Palace was also given to a large building erected as part of the New York World's Fair of 1853. The site was on Sixth Avenue, between 40th and 42d streets. In 1856 it was destroyed by fire. The locality is now Bryant Park.

CRYSTAL SPRINGS, town, Mississippi, in Copiah County, in the southwestern part of the state. Crystal Springs is situated 23 miles southwest of Jackson, at an altitude of 465 feet. It is a tomato-shipping center served by the Illinois Central Railroad, and manufactures boxes and clothing. Pop. (1950) 3,676.

CRYSTALLINE. See CRYSTALLOGRAPHY—*Crystal Structure*.

CRYSTALLOGRAPHY, the science of crystallization, treated in this article under the following sectional headings:

1. Crystal Morphology
2. Crystal Optics
3. Crystal Physics
4. Crystal Structure

Other aspects of crystallography receive separate treatment under such headings as CHEMICAL CRYSTALLOGRAPHY; CRYSTALS, SYNTHETIC; and MINERALOGY.

1. CRYSTAL MORPHOLOGY. The definition of a crystal rests on the concept of the lattice. A lattice *abc* is an assemblage of points, called nodes, which are the end-points of the vectors

$$L_{uvw} = u\mathbf{a} + v\mathbf{b} + w\mathbf{c}, \quad (1)$$

where the unit vectors *a*, *b*, *c* are not coplanar and *u*, *v*, *w* are all the integers (positive, negative, or zero). It is not a physical concept, but a purely mathematical one—a geometrical way of representing triperiodicity, or repetition by translations in three dimensions.

A crystal is a homogeneous portion of crystalline matter, that is, matter whose intimate architecture is triperiodic (see 4. *Crystal Structure*). This kind of homogeneity is called periodic homogeneity (as opposed to the statistical homogeneity of glass, for instance). It exists only on the scale of direct observations with the naked eye or with the microscope; it disappears on the atomic scale. A crystal need not be bounded by faces; some crystals are (they are called enehedral) and those assume polyhedral shapes. The triperiodicity of a crystal is expressed by the crystal lattice. The period is a parallelepiped called the cell. A net is a two-dimensional lattice, whose period is a parallelogram called the mesh. A row is a one-dimensional lattice whose period, the spacing between two successive nodes, is the parameter or the translation of the row. The periodicity of a wall-paper is expressed by a net; that of its frieze by a row. A space lattice may be visualized as a family of equidistant nets or as a sheaf of parallel rows, the nets or the rows lying in any one of many possible directions.

The co-ordinate axes *Ox*, *Oy*, *Oz* (also called crystallographic axes) are taken along the rows *a*, *b*, *c*, from the origin node *O*. A row line *ON* that joins the origin node *O* to the node *N* with co-ordinates *ua*, *vb*, *wc* is designated by the symbol [*uvw*]. The trimetric co-ordinates *u*, *v*, *w* of the node *N* are, of course, integers; they are called the indices of the row line *ON*. A net

plane can be defined by its intercepts ea , fb , gc on the co-ordinate axes. The integers e , f , g are called the Weiss coefficients (1809). To designate the direction of any plane parallel to the net plane, only the ratios of the intercepts are needed. We have

$$ea : fb : gc = \frac{a}{fg} : \frac{b}{ge} : \frac{c}{ef} = \frac{a}{h} : \frac{b}{k} : \frac{c}{l}.$$

Because e , f , g are integers, h , k , l are also integers. If they are not co-prime, let n be their common factor, so that

$$h = nh', \quad k = nk', \quad l = nl'.$$

First used by Whewell and even by Weiss, but popularized by Miller (1839), the co-prime integers h' , k' , l' are universally known as the "Miller indices" of the net plane. The family of equidistant net planes ($h'k'l'$) divides the unit vectors into equal parts, namely a into h' parts, b into k' parts, and c into l' parts. Let $d(h'k'l')$ be the interplanar distance, that is, the perpendicular distance between any two successive net planes in the family; let $A(h'k'l')$ be the mesh area of the net ($h'k'l'$); then

$$A(h'k'l') \cdot d(h'k'l') = V,$$

where V is the volume of the cell.

Symmetry.—An operation that transforms a figure F into a figure F' is called an operation of the first or of the second kind according as F' is congruent (superposable) or enantiomorphous (mirror-image) to F . If F' coincides with F , the operation is called a symmetry operation; it is said to bring F to self-coincidence. For example any lattice translation L_{uvw} is an operation of the first kind and is a symmetry operation of the lattice. An inversion through the center of gravity of a geometrical cube is an operation of symmetry of the cube; the inversion is an operation of the second kind. The collection of symmetry operations of a crystal polyhedron is a finite group; the collection of symmetry operations of a crystal structure is an infinite group. In these sentences the word group (Galois, 1832) is used in its mathematical sense, for—in accordance with the definition of a group—the following conditions are fulfilled: (1) among the operations of the collection, there always exists a unit operation, also called identical operation or identity (it consists in leaving the figure untouched); (2) the product of any two symmetry operations of the collection (or the square of any one) is itself a symmetry operation of the collection (the symbolic multiplication consists in applying the two operations in succession); (3) the symbolic multiplication is associative; (4) to every operation x there exists an inverse operation x^{-1} (such that the product of the two is the identical operation: $xx^{-1} = x^{-1}x = x^0 = 1$). For example, if x is a counterclockwise 90° rotation about a certain axis, its inverse x^{-1} is a clockwise 90° rotation or a counterclockwise 270° rotation about the same axis.

Point Groups.—To study the symmetry of a crystal polyhedron, it is convenient to replace it by the sheaf of its face normals, that is, the sheaf of perpendiculars dropped onto the faces from any point inside the crystal. This scheme emphasizes the direction of a face in contradistinction to its position in space. Bringing a crystal to self-coincidence means bringing its sheaf of face normals to self-coincidence. One

point, the apex of the sheaf, remains fixed (hence the name point group).

The two kinds of symmetry operations are (1) a rotation about an axis through an angle $360^\circ/n$; (2) a rotation combined with an inversion through a point lying on the axis (the fixed point); this is called a rotatory-inversion. In either operation the value of n must be one of the integers 1, 2, 3, 4, and 6. Proof of this statement follows from the properties of a lattice. One may get an intuitive idea of the proof from the fact that a floor cannot be paved with pentagons, nor with any polygons having more than six sides (regular polygons, that is).

A symmetry operation and all its powers constitute a group called a symmetry element. For example, let x designate a 120° rotation about a certain axis. The operations: $x = 120^\circ$ rotation, $x^2 = 240^\circ$ rotation, $x^3 = 360^\circ$ rotation $= x^0 = 1$, constitute a symmetry element, which is called a rotation axis of 3-fold symmetry or a rotation axis of order 3, and is symbolized by the figure 3. Any rotation axis is likewise designated by the integer n that expresses the smallest rotation angle, $360^\circ/n$. The powers of a rotatory-inversion constitute an inversion axis of symmetry, it is designated by the symbol \bar{n} , where n has the same values as above. For example, let y designate a 90° rotatory-inversion. The 4-axis comprises the following operations: $y = 90^\circ$ rotatory inversion, $y^2 = 180^\circ$ rotation, $y^3 = 270^\circ$ rotatory-inversion, $y^4 = 360^\circ$ rotation $= y^0 = 1$. It is seen that a 4-axis includes a 2-axis as a subgroup. Because a 360° rotatory-inversion is nothing more than an inversion in a point, the group 1 is called a center of symmetry (neither 1 nor $\bar{1}$ is defined in direction). Because a 180° rotatory inversion is equivalent to a reflection in a plane perpendicular to the axis ($\bar{2} = m$), the symbol 2 is always replaced by m , and the symmetry element is called a mirror (plane of symmetry), in the Hermann-Mauguin symbolism (1930). The 3-axis expresses the co-existence of a 3-axis and a center ($3 \times \bar{1} = \bar{3}$). The 6-axis would likewise be produced by combining a 3-axis with a mirror perpendicular to it ($3 \times \bar{2} = \bar{6}$); it could therefore be symbolized $\frac{3}{m}$ instead of $\bar{6}$

($3 \times \frac{1}{m} = \frac{3}{m}$), but the symbol $\bar{6}$ is preferred for the sake of mathematical elegance (see Table 1).

The 4-axis is indispensable and irreducible.

The problem of finding all the possible groups of symmetry operations is simplified from the fact that an operation is always accompanied by all its powers so that, instead of combining symmetry operations in all possible manners, it suffices to combine symmetry elements. The solution to this problem was first given by Hessel (1830), but it fell into oblivion until Schoenflies (1891) drew attention to it. Meanwhile independent derivations were proposed (Bravais, 1848; Gadolin, 1864). The 32 point groups are presented in Table 1. The symmetry symbols (under heading "Point Groups") comprise one, two, or three columns. Each column describes the kind of symmetry pertaining to a given direction and all directions similar to it (or equivalent, or of the same kind). A singular direction is a direction different from all others. In the orthorhombic system, there are three singular

CRYSTAL SYSTEMS		Point Groups	Lattice Modes, Lattice Symmetries and Choice of Co-ordinate Axes			Shape of Cell*
Trimetric Systems (Optically Biaxial)	TRI-CLINIC	1 $\bar{1}$	Triclinic-P; $\bar{1}$. Co-ordinate axes parallel to shortest three lattice translations that make all interaxial angles nonacute ($c < a < b$).			$a \neq b \neq c$ $\alpha \neq \beta \neq \gamma \neq 90^\circ$
	MONO-CLINIC	m 2 $\frac{2}{m}$	Monoclinic P or (C, A, or I); $2/m$. Symmetry direction taken as b . Shortest two translations normal to b taken as c and a ($c < a$, β obtuse).			$a \neq b \neq c$ $\gamma = \alpha = 90^\circ, \beta \neq 90^\circ$
	ORTHO-RHOMBIC	$\begin{Bmatrix} 2 & m & m \\ m & 2 & m \\ m & m & 2 \end{Bmatrix}$ 2 2 2 $\frac{2}{m} \frac{2}{m} \frac{2}{m}$	Orthorhombic P, (C, A, or B), I, or F; $2/m 2/m 2/m$. Three symmetry directions taken as a, b, c , respectively ($c < a < b$).			$a \neq b \neq c$ $\alpha = \beta = \gamma = 90^\circ$
Dimetric Systems (Optically Uniaxial)	TETRAGONAL	$\bar{4}$ 4 $\frac{4}{m}$ $\begin{Bmatrix} \bar{4} & 2 & m \\ \bar{4} & m & 2 \end{Bmatrix}$ 4 m m 4 2 2 $\frac{4}{m} \frac{2}{m} \frac{2}{m}$	Tetragonal P (=C) or I(=F); $4/m 2/m 2/m$. First symmetry direction taken as c . Second symmetry direction (shortest translations normal to c) taken as a and b .			$a = b \neq c$ $\alpha = \beta = \gamma = 90^\circ$
	HEXAGONAL s.v.	3 $\bar{3}$ $\begin{Bmatrix} 3 & m & 1 \\ 3 & 1 & m \end{Bmatrix}$ $\begin{Bmatrix} 3 & 2 & 1 \\ 3 & 1 & 2 \end{Bmatrix}$ $\begin{Bmatrix} \bar{3} & 2 & 1 \\ \bar{3} & m & 1 \end{Bmatrix}$ $\begin{Bmatrix} \bar{3} & 1 & 2 \\ \bar{3} & m & 2 \end{Bmatrix}$ $\begin{Bmatrix} \bar{6} & 2 & m \\ \bar{6} & m & 2 \end{Bmatrix}$ 6 m m 6 2 2 6 2 2 $\frac{6}{m} \frac{2}{m} \frac{2}{m}$	Hexagonal-P (formerly C); $6/m 2/m 2/m$. First symmetry direction taken as c . Second symmetry direction (shortest translations normal to c) taken as a and b .	3 $\bar{3}$ 3 m 3 2 $\bar{3} \frac{2}{m}$	Hexagonal-R (= rhombohedral-P)†; $\bar{3} 2/m 1$. Axes as in Hexagonal-P.	$a = b \neq c$ $\alpha = \beta = 90^\circ$ $\gamma = 120^\circ$
Isometric System (Optically Isotropic)	CUBIC	2 3 $\frac{2}{m} \frac{3}{m}$ $\begin{Bmatrix} \bar{4} & 3 & m \\ \bar{4} & 3 & 2 \\ \bar{4} & 3 & 2 \end{Bmatrix}$ $\frac{2}{m} \frac{3}{m} \frac{2}{m}$	Cubic P, I, or F; $4/m \bar{3} 2/m$. First symmetry direction taken as a, b , and c (cube edges).			$a = b = c$ $\alpha = \beta = \gamma = 90^\circ$

* The sign \neq stands for "not necessarily equal to."† The shape of the primitive rhombohedral cell is given by $a = b = c$, $\alpha = \beta = \gamma \neq 90^\circ$.

Table 1

symmetry directions. In the dimetric systems, the first symmetry direction is singular; the number in the first column indicates how many symmetry directions in all are expressed by the last two columns. For example, 6 2 2 means: one 6-axis and six 2-axes in all, three of one kind, three of another. In the cubic system, the first column refers to the three equivalent directions perpendicular to the cube faces, the second column refers to the four body diagonals, the third column to the six directions that are parallel to the face diagonals.

Although a lattice is an infinite figure, it possesses point-group symmetry. Indeed, if anywhere in a lattice there exists a symmetry axis, the line passed through any node parallel to this axis is itself (or includes) a symmetry axis of the same order. The same holds true of mirrors. From the very definition of the lattice, moreover, a node is a center of symmetry. It follows that all symmetry elements can be made to pass through a node, which thus becomes the fixed point of a point group. To be a lattice symmetry, however, a point group must fulfill two conditions: (1) it must have a center; (2) if it has an n -axis, with n greater than 2, it must also have n 2-axes perpendicular to the n -axis. On this basis 7 of the 32 point groups are possible lattice symmetries. The symmetry is reflected in the shape of the cell, as expressed by the relative sizes of the edges a , b , c and the values of the interaxial angles $\alpha = \angle Oyz$, $\beta = \angle zOx$, $\gamma = \angle xOy$. Some edges must be equal and some angles must have special values (90° or 120°) on account of symmetry; these requirements are rigorous and hold at all temperatures. Fortuitous equality of two cell edges or angles accidentally equal to 90° can also occur within the limits of experimental accuracy, but not at all temperatures. The problem of finding the various lattices that possess a given point-group symmetry—the lattice modes of this lattice symmetry—was solved by Bravais (1849). He found 14 lattices in all (instead of Frankenheim's 15 announced in 1842), unequally distributed among the 7 lattice symmetries (Table 1). For each lattice symmetry the lattice may be primitive (P), that is, the cell defined by the vectors \mathbf{a} , \mathbf{b} , \mathbf{c} is as small a cell as can be chosen. It contains only one node (eight corners, shared by neighboring cells, count for one-eighth each). In a given lattice all primitive cells have the same volume regardless of their shapes. In some cases the lattice is centered, that is, the cell \mathbf{a} , \mathbf{b} , \mathbf{c} is a multiple cell, containing more than one node. It may be one-face-centered (either A-, B-, or C-centered, according as the front, the side, or the base of the cell carries the extra node) in which case the cell is a double cell—2 nodes per cell; body-centered (I), also with a double cell; all-face-centered (F), with a quadruple cell; rhombohedral (R), in which case a hexagonal cell, namely a vertical prism with 120° -rhombohedral base, carries two extra nodes with trimetric co-ordinates ($2/3$, $1/3$, $1/3$) and ($1/3$, $2/3$, $2/3$). Rhombohedral "centering" of a hexagonal cell reduces the lattice symmetry from $6/m\ 2/m\ 2/m$ to $\bar{3}\ 2/m$.

The lattice symmetry forms a satisfactory basis for a classification into 7 crystal systems. Many authors, however, prefer 6 crystal systems. In this scheme (Table 1) a single hexagonal system *sensu vasto* includes any crystal whose lattice is either hexagonal-P or hexagonal-R.

External Form.—The laws of observation of

the early crystallographers can be expressed most simply in terms of the lattice: (1) Faces are parallel to net planes and edges to row lines. This is the law of Constancy of Angles, first noted for quartz crystals by Steno (1669), extended to various salts by Guglielmini (1688), and stated in its full generality by Romé de l'Isle (1772). (2) Faces are parallel to families of nets with large interplanar distances. This is the law of Rationality, which was discovered by Haüy in 1784. (It can also be expressed as follows: faces have small Miller indices.) (3) The larger the interplanar distance $d(h'k'l')$ is, the more frequently the face $(h'k'l')$ occurs on crystals of a given species. This is the law of Bravais (1849), a refinement of the law of Haüy, true to a first approximation. (4) The frequency of a face is better measured by $d(hkl)$, where h , k , l are the smallest indices (non co-prime if need be) that obey the space-group criteria (see below). This is a generalization of the law of Bravais (Donnay and Harker, 1937), an improved approximation still falling short of giving a physical explanation of crystal morphology. Recent work in this direction points to bonding, a crystal-structure concept, as having a controlling influence (Hartman and Perdok, 1953).

Determination of Cell Dimensions.—X-ray diffraction methods (see 4. *Crystal Structure*) yield absolute dimensions. From morphology only interaxial angles and ratios of cell edges can be obtained. The experimental data are angles: either interfacial angles, measured by means of a one-circle goniometer (Carangeot, 1780), or the co-ordinate angles of the faces, measured on a two-circle goniometer. The interfacial angle is the angle between the face normals, directly obtainable (to a few minutes of arc) on the reflecting goniometer (Wollaston, 1809). The co-ordinate angles are the longitude and the colatitude of the face pole, the point where the face normal intersects a sphere (sphere of projection) drawn around the crystal. Angles between edges or between the projections of edges can also be obtained, with less accuracy (0.5° to 1°) from microscope goniometry.

The co-ordinate axes must be taken parallel to rows. Because symmetry directions are parallel to rows, they can be used as co-ordinate axes (see Table 1). A face intersecting all three axes is chosen as unit face (111). It determines, on the axes, three lengths a , b , c , the ratios of which can be determined from the direction angles, ξ , η , ζ , of its normal. From geometry

$$a : b : c = \frac{1}{\cos \xi} : \frac{1}{\cos \eta} : \frac{1}{\cos \zeta}.$$

The Miller indices $(h'k'l')$ of any other face can then be calculated from the direction angles ξ , η , ζ of its normal, by means of the following formula, which is but another statement of the law of Rationality:

$$h' : k' : l' = a \cos \xi : b \cos \eta : c \cos \zeta.$$

The direction angles are either measured or calculated from measured angles. The unit lengths a , b , c define a parallelepiped, which may be taken as the cell of a lattice. By a proper choice of the unit face, it is always possible to find a lattice for which the law of Bravais holds true. (Indeed this remark is the best statement of the law.) Before the advent of X-ray diffraction, this is how lattices were determined (Mallard, 1879 and especially G. Friedel, 1904). Some

morphological lattices were confirmed by X-rays; many turned out to be wrong, in the sense that they did not express the true periodicity of the crystal. The generalized law proved more powerful, leading not only to the lattice but to the correct space group in most cases.

Crystal Forms.—In a crystal point group, the assemblage of equivalent faces (hkl) is called a form $\{hkl\}$; for the assemblage of equivalent edges $[uvw]$ the word frame $\langle uvw \rangle$ has been proposed. The number of faces in a form is its multiplicity. The general form, that is, the form whose faces are not perpendicular to any symmetry element, has a multiplicity equal to the order of the point group. There exist 47 forms distributed among the 32 point groups. The lowest multiplicity is 1, the highest 48; the corresponding forms are called monohedron and hexaoctahedron. Other forms are: prisms, pyramids, dipyrramids, tetrahedron, cube, etc.

Space Groups.—The symmetry operations to be considered in space groups are those of the point groups, plus translations, plus screw-rotations and glide-reflections. These additional operations result from the combination of a translation with a rotation or a reflection. The corresponding symmetry elements are the screw axis and the glide plane. A screw axis is designated p_n ; the rotation angle is $360^\circ/p$ and the translation is equal to a fraction q/p of the lattice translation parallel to the axis ($q = 1, 2, \dots, p-1$). Screw axes are: $2_1, 3_1, 3_2, 4_1, 4_2, 6_1, \dots, 6_5$. A glide plane is designated a, b, c, n , or d according as the glide is equal to one half of a lattice translation along one of the axial vectors, one half of a face diagonal (n), or one fourth of a face diagonal (d) in the case of a centered face. The 230 space groups were independently discovered by E. Fedorov (1890) and A. Schoenflies (1891). W. Barlow nearly found them all (1894). In a crystal space group, the assemblage of equivalent atomic sites is called a position; the number of sites in a position is its multiplicity. The multiplicity of the general position is the order of the space group. It ranges from 1 to 192.

Reciprocal lattice.—The reciprocal lattice $a^*b^*c^*$ is a useful concept, defined as follows. At the origin of the crystal lattice (direct lattice), vectors a^*, b^*, c^* are erected perpendicular to the axial planes bc, ca, ab and on the same side of each axial plane as a, b, c , respectively. The lengths a^*, b^*, c^* are proportional to the mesh areas bc, ca, ab ; the factor of proportionality is normally taken as $1/V$, although other factors are sometimes used: $1/\sqrt{V}$, in Bravais' polar lattice; λ/V in Bernal's lattice, where λ is an X-ray wavelength (see 4. *Crystal Structure*). Two properties follow: (1) Any reciprocal-lattice vector $L^*_{hkl} = ha^* + kb^* + lc^*$ is perpendicular to the family of nets (hkl) of the direct lattice. (2) the length of L^* is equal to the reciprocal of the interplanar distance $d(hkl)$ in the direct lattice, $d(hkl) = 1/|L^*_{hkl}|$. If $h = nh', k = nk', l = nl'$, it is clear that $L^*_{hkl} = nL^*_{h'k'l'}$, where

$$L^*_{h'k'l'} = h'a^* + k'b^* + l'c^*,$$

so that $d(hkl) = d(h'k'l')/n$.

The law of Bravais can be expressed in terms of the reciprocal lattice: the shorter the reciprocal-lattice vector, the more frequent the corresponding face. Halving an interplanar distance means doubling the corresponding reciprocal-lattice vec-

tor, so that lattice or space-group criteria are expressed by missing nodes in the reciprocal lattice (morphological extinctions). Example: in an all-face-centered lattice abc , the nets ($h'k'l'$) for which the co-prime indices are not all odd have their interplanar distance halved (as compared to what it is in the primitive lattice). This is expressed by doubling the indices, which are thus made to obey the criterion "indices all even." The reciprocal-lattice nodes whose indices do not obey the criterion "all odd or all even" are "extinguished."

Twinning.—Besides occurring as homogeneous crystals, crystalline matter form heterogeneous edifices called twins. A twin is an assemblage of two or more crystals, symmetrical of one another with respect to a twin element. The twin operation brings crystal I to coincide with crystal II. It may be a rotation of $60^\circ, 90^\circ, 120^\circ$, or 180° about a twin axis; a reflection in a twin plane; or an inversion in a twin center. Several twin operations may exist simultaneously. The surface of junction of two crystals in a twin is called composition surface; it may be planar (contact twinning) or irregular (penetration twinning). Twinning may be dual (2 crystals) or repeated (more than 2 crystals); if repeated, it may be polysynthetic (parallel lamellae) or cyclic (crystals inclined to one another).

Twinning is found to occur when a net and a row happen to be either exactly or nearly perpendicular. The cell built on this net and this row is that of a lattice—the twin lattice—which expresses partial periodicity of the crystalline edifice. The twin lattice, either rigorously or approximately, has more symmetry than the crystal (or even than the crystal lattice); the symmetry operations that the twin lattice possesses and that the crystal does not possess can play the role of twin operations (G. Friedel, 1904). Example: pyrite, FeS_2 . Crystal symmetry, $2/m\bar{3}$. Crystal-lattice symmetry and twin-lattice symmetry, $4/m\bar{3}2/m$. All operations present in the second symmetry symbol and not in the first are simultaneous twin operations.

Consult Phillips, F. C., *Introduction to Crystallography* (London 1946).

J. D. H. DONNAY,
Professor of Crystallography and Mineralogy,
The Johns Hopkins University.

2. CRYSTAL OPTICS. Optical crystallography is concerned with the behavior of light transmitted or reflected by crystalline substances. The development of the theory is based on the unproved assumption that light consists of oscillatory wave motion resulting from a combination of propagation and vibration transverse to the direction of propagation. Routine observations utilize either a white light source or a monochromatic source emitting a single color of the visible spectrum. Special investigations have been made with energy sources producing ultraviolet or infrared radiations.

The basic tool for optical study of light-transmitting crystals is a polarizing microscope, which differs from an ordinary microscope in having a removable polarizing filter or prism called an *analyser* above and a fixed polarizing device called a *polarizer* below a rotatable stage. Microscopic optical studies of opaque materials are made in reflected light which can be made to pass through polarizing devices before and after reflection. Light passing through either

the analyzer or the polarizer is constrained to vibrate in a single plane and is described as *plane-polarized light*. In the polarizing microscope the analyzer is oriented so that when it is inserted its plane of polarization is perpendicular to that of the polarizer, and no light is transmitted by the microscope. However, crystals or fragments of most substances placed on the stage change the manner in which light is transmitted by the microscope and produce characteristic optical effects.

The optical constants, which in common with the other physical properties of crystals are characteristic and diagnostic for each substance, are measured or estimated with the aid of auxiliary lenses and calibrated optical accessories. The fundamental optical constants of nonopaque crystals are the *principal indices of refraction*, the *crystallographic orientation of the directions of light vibration corresponding to these indices of refraction*, and the *amount of absorption of light vibrating in these directions*, all expressed in terms of one or more standard wave lengths of light. Properties that may be predicted if the

Snell's Law, which states that $n = \frac{\sin i}{\sin r}$, where i is the angle of incidence of light entering a crystal and r is the angle of refraction of light by the crystal.

Another useful equation states that $v = f\lambda$, where v is the velocity, f is the frequency, and λ is the wave length. From this equation it is seen that the velocity of light is directly proportional to its wave length, and, inasmuch as the refractive index is inversely proportional to the velocity of light in a medium, it follows that the refractive index is also inversely proportional to the wave length of the transmitted light. The simplest expression of this fact is seen where white light enters a triangular glass prism and is split into the component colors of the visible spectrum. Light of shortest wave lengths (violet) is refracted (bent) the most, and long wave lengths (red) are refracted the least.

Variations in optical properties dependent on the refractive indices may be visualized with the aid of the optical indicatrix, a geometric form which in triclinic, monoclinic, and orthorhombic

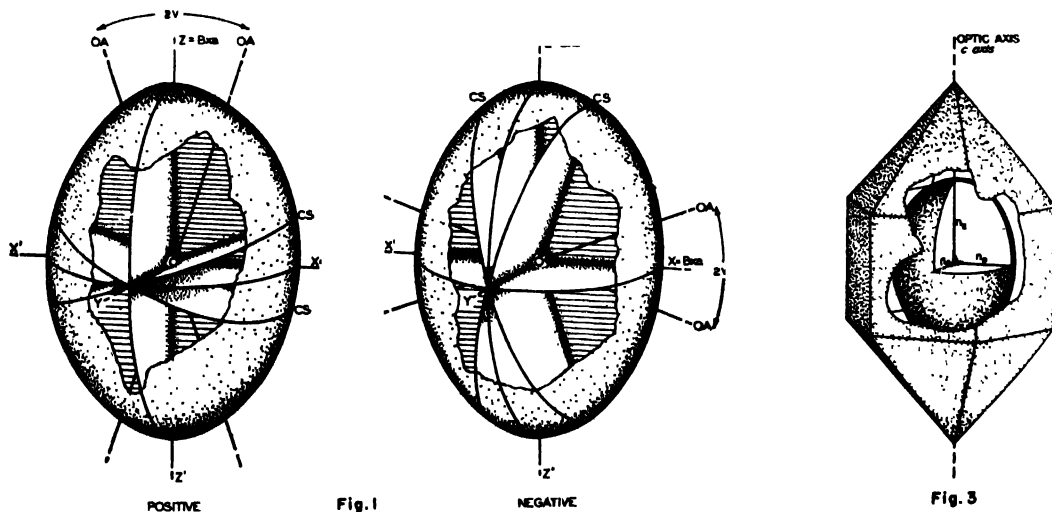


Fig. 1. Biaxial indicatrices. Bxa = acute bisectrix; Bxo = obtuse bisectrix; CS = circular section; OA = optic axis.
Fig. 3. Hexagonal crystal showing orientation of indicatrix.

fundamental constants are known are birefringence, optic sign, optic axial angle, extinction angles, color, pleochroism, dispersion of the optic axes, and dispersion of the bisectrices. Properties determined for opaque substances are the color of the reflected light, rotation of the plane of polarization of incident light, and the nature of polarization figures.

The index of refraction (refractive index) is expressed by the equation $n = \frac{V_1}{V_s}$, where V_1 is the velocity of light in vacuum (or air) and V_s is the velocity in the light-transmitting medium. V_1 for light in the visible spectrum is always greater than V_s , and refractive indices always have values in excess of unity. If the velocity of light in vacuum is assumed to be unity, the equation for the refractive index becomes $n = \frac{1}{V_s}$, from which it is seen that the velocity of light traveling through a crystal is inversely proportional to the refractive index of the crystal. Useful in calculating the refractive index is

crystals is a triaxial ellipsoid, in hexagonal and tetragonal crystals an ellipsoid of rotation, and in isometric crystals a sphere. The indicatrix shows the refractive indices of light waves in their *directions of vibration* (transverse to the direction of propagation) for monochromatic light. For each wave length of light in a crystal there is a characteristic indicatrix with a particular orientation.

Figure 1 shows indicatrices of the type characteristic of triclinic, monoclinic, and orthorhombic crystals. The equation for the indicatrix is

$$\frac{x^2}{(n_x)^2} + \frac{y^2}{(n_y)^2} + \frac{z^2}{(n_z)^2} = 1,$$

where n_x , n_y , and n_z (also designated α , β , and γ) are the minimum, intermediate, and maximum dimensions of the indicatrix and correspond to the refractive indices of light waves vibrating parallel to the X , Y , and Z axes, respectively. The numerical difference between the values of n_x and n_z is the *birefringence*. Two circular sections have positions determined by the relative

values of n_x , n_y , and n_z . The optic axes are perpendicular to the circular sections and are directions along which all light waves of the same wave length move with constant velocity. Because there are two such directions, crystals in the triclinic, monoclinic, and orthorhombic systems are described as *biaxial*.

The angle $1'$ between the Z axis and an optic axis is calculated by the equation

$$\tan^2 V_z: \frac{(n_x)^2}{(n_y)^2} - \frac{1}{(n_z)^2} = \frac{1}{(n_y)^2} - \frac{1}{(n_z)^2}$$

If Z is the acute bisectrix, the crystal arbitrarily is described as *positive*, and if X is the acute bisectrix, the crystal is said to be *negative*. The angle $21'$ between the optic axes is the *optic angle*.

The orientation of the X , Y , and Z axes of the indicatrix in a biaxial crystal accords with the crystal symmetry, and is expressed by the angular relations between the crystallographic a , b , and c axes and the axes of the indicatrix. The axes of the indicatrix for a particular wave length in a triclinic crystal occupy a fixed position but, in general, are not parallel to any of

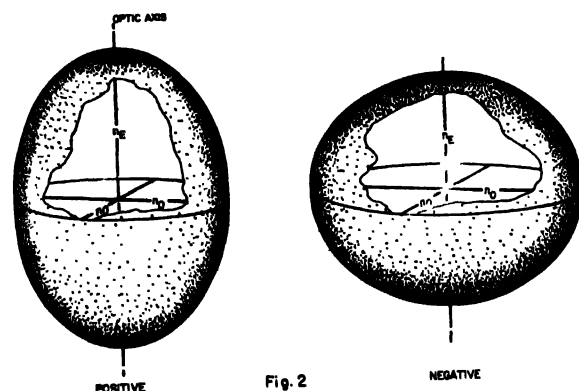
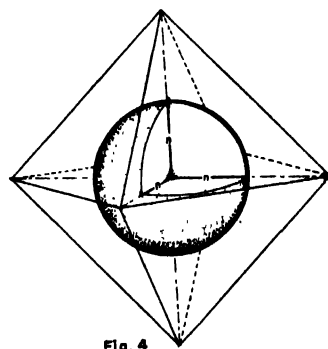


Fig. 2. Uniaxial indicatrices. Fig. 4. Indicatrix for an isometric crystal.



the crystal faces or axes. In monoclinic crystals having a plane of symmetry, X , Y , or Z is parallel to the b crystal axis, and the other two axes lie in the plane of symmetry. In orthorhombic crystals the X , Y , and Z axes are parallel to the mutually perpendicular crystallographic axes.

In hexagonal and tetragonal crystals the equation for the indicatrix is

$$\frac{X^2 + Y^2}{(n_o)^2} + \frac{Z^2}{(n_e)^2} = 1$$

and represents a special case where the optic angle of the biaxial indicatrix has been reduced to zero. Light waves move with constant velocity in only one direction, the direction of the optic axis (Fig. 2), and such crystals are described as *uniaxial*. The refractive indices corresponding to light vibrating parallel to the optic axis and parallel to a radius of the circular equatorial section are designated n_e and n_o (ϵ and ω), respectively. The optic axis is parallel to the c crystallographic axis in all tetragonal and hexagonal crystals (Fig. 3). By definition n_o is greater than n_e in optically positive crystals; the reverse relationship holds for negative crystals.

The indicatrix is a sphere in isometric crystals (Fig. 4) and light of a single wave length travels with equal velocity in all directions through the crystal.

Crystals with two or three principal refractive indices are described as *anisotropic*. Any radius of the indicatrix gives the refractive index of the light wave vibrating along it, and, inasmuch as in anisotropic substances the various radii have different values, waves transmitted in different directions have different velocities.

Experimental observation of anisotropic crystals proves that, except in the directions of the optic axes, the transmitted light consists of two components which vibrate in mutually perpendicular planes and travel with different velocities. The polarizing microscope is capable of detecting this fact, and by a complex process of resolution and composition of the light transmitted by the crystal and by the microscope yields characteristic interference phenomena. A typical anisotropic crystal viewed under the polarizing microscope in white light produces an interference color that is a function of the phasal difference of the two components of transmitted light and during a 360-degree rotation of the microscope stage diminishes to minimum intensity (dark-

ness) four times at the so-called *extinction positions*. Extinction results when appropriate directions of the indicatrix coincide with the mutually perpendicular planes of polarization of the polarizing devices above and below the microscope stage. Measurements of angles between crystallographic planes or directions and positions of extinction yield *extinction angles*, which are useful in determining the orientation of the indicatrix in the crystal. Isometric (isotropic) crystals remain black for all positions under the microscope.

In triclinic and monoclinic crystals the indicatrices occupy different positions for different colors (wave lengths) of light and produce a phenomenon described as *dispersion of the bisectrices*. Moreover, in all biaxial substances the optic angles change as a function of the wave length of light and produce *dispersion of the optic axes*. Fig. 5 illustrates both types of dispersion in a monoclinic crystal in which indicatrices for red and blue, at opposite ends of the visible spectrum, have different orientations and different optic angles.

Viewed in the plane-polarized light transmitted by the polarizer and with the analyzer removed, many anisotropic substances change

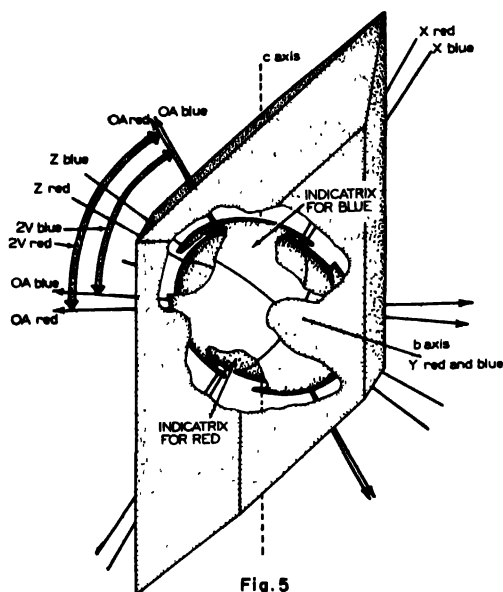


Fig. 5

Fig. 5. Monoclinic crystal showing indicatrices for red and blue light. Note that indicatrices have different orientations and different optic angles. $2V$ = optic angle; OA = optic axis.

color as the microscope stage is rotated. This phenomenon depends on differential absorption of light in different directions in the crystal and is described as *pleochroism*. According to common practice the colors or the relative amounts of absorption that are observed for light vibrating parallel to the X , Y , and Z axes of the indicatrix when a white light source is used are noted and expressed by means of a *pleochroic formula* or an *absorption formula*. Thus, the pleochroic formula for a particular substance might be X = light green; Y = medium green; Z = dark brown; or the absorption formula might be expressed as $X < Y < Z$.

The polarizing microscope is converted to a conoscope by inserting a lens of short focal length below the stage and a Bertrand-Amici lens just below the ocular system. The conoscope permits observation of phenomena depending on the interference of light waves incident on the crystal in a converging cone. Under the conoscope anisotropic substances yield interference figures which are characteristic of each substance and permit determination of the optic orientation, optic sign, axial angle, dispersion of the bisectrices, and dispersion of the optic axes. Inter-

ference figures consist of dark brushes called *isogyres* superimposed on color curves. Uniaxial crystal sections cut at right angles to the optic axis yield an isogyre in the form of a black cross (Fig. 6) in all positions of rotation of the microscope stage. Isogyres in biaxial crystals change position and configuration in a manner dependent on the optic angle and the orientation of the crystal under the microscope as the microscope stage is rotated (Fig. 7).

A variety of techniques is used for measuring the optical properties of crystals. A widely used method employs liquid immersion media of known refractive indices. Fragments or whole crystals are immersed in successive liquids until a particular refractive index is matched by the index of the immersion medium. This condition is reached when there is no refraction of light at the liquid-crystal contact. Measurement of extinction angles, observation of absorption colors, and examination of interference figures permits determination of many or all of the other optical properties. The immersion method is rendered more versatile by taking advantage of the fact that the refractive index of the immersion medium changes with temperature and the wave length of the light source, so that it is possible to match crystal and liquid indices with fewer immersions by controlling the temperature and the light source. The universal stage, a multiaxis device that is mounted on the microscope stage, permits controlled rotation of mounted crystals or fragments into any desired position.

Aggregates of crystals such as those in rocks are studied most successfully in thin sections: plates of the aggregate ground to a thickness of 0.03 mm. and mounted with adhesive cement on a glass slide.

Standard accessory equipment for the polarizing microscope consists of a variety of calibrated devices which enable measurement of phasal difference or produce effects which are a function of the orientation and phasal difference produced by a crystal.

Consult Wahlstrom, E. E., *Optical Crystallography* 2d ed. (New York 1951).

ERNEST E. WAHLSTROM,
Professor of Geology, University of Colorado

ILLUSTRATIONS: Figs. 1 through 5 reproduced from *Optical Crystallography*, 2d ed., by E. E. Wahlstrom, John Wiley and Sons, Inc. (New York 1951).

3. CRYSTAL PHYSICS. The physical properties of crystals began to be studied in Europe about the end of the 17th century. The optical properties of calcite, a crystalline form

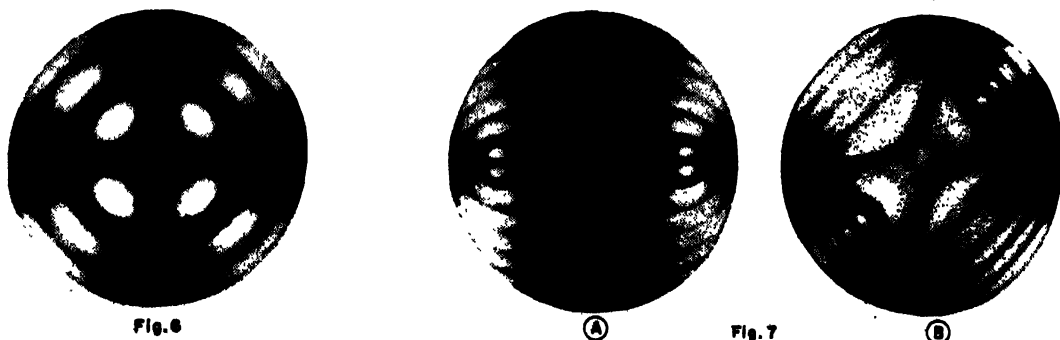


Fig. 6. Interference figure seen when looking along the optic axis of a uniaxial crystal under the conoscope. Fig. 7. Interference figure seen when looking along the acute bisectrix of a biaxial crystal (aragonite) under the conoscope: (A) Parallel position. (B) 45-degree position.

of calcium carbonate, first attracted attention. This material cleaves into transparent blocks which when placed on, for instance, a printed card, produce two images of each printed letter. This property is due to the *double refraction* of the calcite. The optical properties of many types of crystals were studied during the next century and a half and about the middle of the 19th century attention began to be paid to the other physical properties of crystals. The discovery of the way of making an electromagnet led to the study of the magnetic properties of crystals. A natural consequence of this work was the investigation of the electric properties. The development of optical devices for measuring very small changes in length led to the study of the thermal expansion of crystals. At the end of the 19th century the brothers Curie discovered the *piezoelectric* properties of certain crystals and with their application to submarine detection in World War I these properties were most intensively studied in the following years. The mechanical properties of crystals were first studied about the middle of the 19th century. Calcite crystals show the remarkable property of gliding under suitable stresses, as though the structure were like a pack of cards. The phenomenon is known as *plastic deformation* and the study of it became more common after the discovery early in the 20th century of the manner in which molten metal can be cooled so as to produce single crystals. The elastic properties of non-metallic crystals were studied in an academic way at the beginning of the 20th century but, after the important applications of piezoelectricity were made, these properties were studied more intensively because without a knowledge of them the piezoelectric instruments could not be properly constructed. In the early experiments on radio, crystal detectors were used and the *rectifying properties* of various types of crystal have become of great practical importance today.

The physical properties of crystals are distinguished from those of ordinary solid materials by their relation to the symmetry of the crystal. The symmetry also determines the number of coefficients which are needed to define a given property. Thus, for instance, a crystal of calcium thiosulphate, with no axes of symmetry, has eighteen piezoelectric constants, but one of quartz, with several axes of symmetry, has only two such constants. A special type of mathematics—the tensor calculus—is especially valuable in working out the number of physical constants, which are required by the symmetry.

The atomic arrangements are responsible for the differences between crystals and non-crystalline matter. It is difficult, however, to calculate from the known properties of atoms and their known arrangements what physical properties will be found. Some progress has been made but as yet only a partial understanding of this relation exists.

Thermal Properties.—*Thermal Expansion.*—A sphere cut from a cubic crystal remains a sphere after changing its temperature. A sphere cut from a uniaxial crystal changes into an ellipsoid of revolution and one cut from a biaxial crystal becomes a tri-axial ellipsoid. There is only one *thermal expansion coefficient* (change of length per unit length per unit change of temperature) for a cubic crystal; uniaxial crystals have two *principal expansion coefficients* which refer to the axis of the ellipsoid of revolution

and any perpendicular direction passing through the center respectively; biaxial crystals have three principal expansion coefficients associated with the three mutually perpendicular axes of the triaxial ellipsoid. Some crystals, e.g. calcite, expand in one direction while contracting in others. In such a case there are some directions in which the crystal neither expands nor contracts with change of temperature. The expansion of iron bridges in summer, and the expansion of the metal leads into electric lamps during manufacture, are examples of the importance of the expansion of poly-crystalline materials.

Thermal Conductivity.—The same relations hold between the *coefficients of thermal conductivity* and the symmetry as apply to thermal expansion. This conductivity coefficient is defined as the heat flow per second per unit area in a given direction per unit temperature gradient. If heat is supposed to flow outwards from a point within a crystal towards boundaries which are far off, the points at which the temperature is the same lie on an *isothermal surface*. Such surfaces are in general triaxial ellipsoids but in uniaxial or cubic crystals they become ellipsoids of revolution and spheres respectively.

Thermo Electricity.—When a block of electrically conducting crystal is held between ordinary metal plates maintained at different temperatures a *thermo electro-motive-force* is established across the crystal. The coefficients of this property obey the same symmetry relations as those of thermal conductivity. The thermo e.m.f.s. generated by crystals are often strongly dependent on small amounts of impurities or mechanical strain or disorder in the arrangement of the lattice.

Magnetic Properties.—*Diamagnetism.*—A *diamagnetic crystal* when placed in a non-uniform magnetic field tends to move towards the region of weaker field strength. Most crystals are of this kind with the exceptions mentioned below of the *para-* and *ferro-magnetic* crystals. The *magnetic susceptibility* is defined, for a given direction in the crystal, as the magnetic moment per unit volume induced by unit magnetic field strength when both the induced moment and the applied field are measured in the direction specified. Like the properties of thermal conductivity etc., this is also represented by a second order tensor and obeys identical symmetry laws. Certain organic crystals show a simple relation between the coefficients of susceptibility and the crystal structure and much use has been made of this in checking structures determined by X-rays.

Paramagnetism.—A *paramagnetic crystal* when placed in a non-uniform magnetic field tends to move towards the region where the field is stronger. Crystals containing ions of transition elements such as Cu^{2+} , Fe^{2+} etc. and rare earth ions such as Y^{3+} , Ce^{3+} etc. show this property. The paramagnetic susceptibility is not related to the atomic arrangement in the same direct way as the diamagnetic susceptibility but depends on the character of the individual ions. The environment of these ions in some cases mainly determines the property of the whole crystal.

Ferromagnetism.—A *ferromagnetic crystal* when placed in a non-uniform field tends to move with great force towards the stronger parts of the magnetic field. The forces involved with these materials are usually thousands of times greater

than those obtained with either para- or diamagnetic crystals.

Symmetry operates in determining the variation of the ferro-magnetic susceptibility with direction but the laws are more complicated than those which apply to the second order tensors. Lodestone, which is a magnetic oxide of iron, Fe_3O_4 , has from ancient times been used by sailors as a magnetic compass. In modern times the whole basis of electrical machinery depends on the magnetic properties of iron and some of its alloys. To an ever increasing extent applications are being made of the special directional properties of single crystals of these magnetic materials.

Electrical Properties.—*Electrical Conductivity*—The coefficients of electrical conductivity or resistivity for metallic single crystals vary with direction of current flow in accordance with the symmetry requirements in the same way as the coefficients of thermal conductivity mentioned above. Most ordinary metals are cubic but magnesium, zinc, cadmium, among others, are hexagonal and tin is tetragonal.

Piezoelectricity.—When certain non-conducting crystals are compressed they develop electric charges of opposite sign on opposite sides of the crystal. This property is known as *piezoelectricity*. Such crystals also expand or contract when subjected to an electric field. This property can only be shown by a crystal lacking a center of symmetry. The constants which define the property of piezoelectricity are called third order tensors because they relate a first order tensor (the electric moment produced) to the stress applied (a second order tensor). The number of such constants varies from 18 to one, according to the degree of symmetry present. Crystals of quartz, SiO_2 , and several other materials, are cut and ground accurately to size so that their frequencies of mechanical vibration have given values. These crystals are used in conjunction with oscillatory electrical circuits to generate alternating current of known and very constant frequency. When used in this way they are known as *piezoelectric oscillators* and find application in special clocks, and in radio transmitting and receiving stations. When a single telephone cable is used to transmit simultaneously several hundred telephone messages, crystals of this sort are often used to separate the messages from one another. This is done by electrical filters and the crystals in them are called *piezoelectric resonators*. When such crystals are caused to oscillate in a liquid they generate mechanical waves which on account of their high frequency are called *supersonic*. Such waves have uses in submarine sounding, in ageing whisky, in laundering clothes, and in locating cracks in metallic objects.

Ferroelectricity.—Certain crystals lacking a center of symmetry show the property of becoming spontaneously electrically polarised in the same sense over relatively large volumes. This phenomenon can give rise to dielectric constants of abnormally high value, say 10^4 , and also to abnormally large piezoelectric charges. By analogy with ferromagnetic crystals such materials are called *ferroelectric*. Rochelle salt, $\text{NaKC}_4\text{H}_4\text{O}_6 \cdot 4\text{H}_2\text{O}$ and barium titanate, BaTiO_3 , are examples of this sort of material. The large values of the piezoelectric constants of ferroelectric crystals make them very valuable for certain applications in which a small mechanical force is required to produce a large electric charge.

Pyroelectricity.—Certain crystals develop electric charges of opposite sign at opposite ends being heated. Such crystals are called *pyroelectric*. This property is shown by many piezoelectric crystals and is in part due to the same atomic movements which give rise to the piezoelectricity. It is of no importance except in the study of crystal structure. If a crystal can be shown to be pyroelectric it must lack a centre of symmetry and this is often an essential piece of information in determining the atomic arrangement.

Dielectricity.—All insulating crystals when placed in an electric field become electrically polarised. This polarisation is subject to the same laws of symmetry as other second order tensors. If the capacities of a parallel plate condenser when the plates are separated (1) by the crystal, (2) by air, are C_1 and C_0 respectively, then the *dielectric constant* for the direction perpendicular to the surfaces of the crystal plate is C_1/C_0 . This constant varies between a few units up to ten for usual dielectrics but for ferroelectric materials it may reach the order of 10^4 at certain frequencies and temperatures.

Semiconducting Crystals.—Many crystals have conductivities well below those of ordinary metals and much in excess of those of normal insulators. Such crystals are known as *semiconductors*. The conduction is closely dependent on small changes of chemical composition, on the presence of impurities, on defects in the growth of the crystal or on the externally applied stresses. Many crystals of great practical importance fall into this group. The rectifying crystals such as cuprous oxide, Cu_2O , or selenium, are used in electrical engineering on a large scale; galena, PbS , crystals as well as many other such crystals, are used as "cats-whisker" rectifiers in primitive radio receivers and crystals of germanium and silicon are receiving much application as transistors.

Mechanical Properties.—*Elasticity*.—When subjected to mechanical stresses crystals change their shape i.e. they develop strains. The coefficients relating stresses and strains define the elasticity. The number of such constants varies from 21 when the crystal has no symmetry down to three when it has the maximum symmetry possible, namely cubic symmetry. Elastic constants may be measured in a variety of ways. If large specimens can be cut into plates or bars they can be bent or twisted by known forces and the amount of deformation measures the elasticity. If they can only be had in small pieces supersonic waves are used to cause them to vibrate. From the dimensions of the crystal and the natural frequency of its vibration the elastic properties can be determined.

The elasticity of crystals is studied partly for its own sake but principally to make it possible to fashion in the best manner various piezoelectric oscillators and resonators. The elastic properties of polycrystalline metals have great technical importance. The knowledge of the elasticity of single crystals of these metals is likely to throw much light on certain metallurgical problems.

Plasticity.—A large number of single crystals when subjected to stresses above a certain limit become permanently deformed. Such crystals are said to be *plastic*. Perhaps the most striking example of this phenomenon is afforded by a single-crystal wire of cadmium or zinc. Whereas a polycrystalline wire of the same material will not lengthen permanently until a certain force

is applied to it, if the material is made into a single crystal it may deform permanently under a stress one hundredth, or less, of that required to deform similarly the polycrystal. A plastic single crystal usually changes its shape in the way to be expected if it consisted of a number of lamellae all parallel to a *glide plane*, parallel to which they can all move relatively easily. The lamellae are only free to move in one direction, known as the *glide direction*, lying in the glide plane. One geometrical consequence of this is that a cylindrical wire on being pulled out usually develops an elliptical cross-section. Plasticity is usually associated with the property of *work-hardening* so that the more the crystal is deformed the greater is its resistance to the deforming force. The combination of the two properties of plasticity and work-hardening gives many metallic materials their technically useful character.

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W. A. WOOSTER,

Lecturer in the Department of Mineralogy and Petrology, Cambridge University, England.

4. CRYSTAL STRUCTURE. The useful magnification which can be attained with optical microscopes is limited by the wavelength of visible light (ca. 4,000 to 7,500 Å.) and, as a result, objects less than about 2,000 Å apart cannot be resolved even with the best optical microscopes. Atoms in solids are often less than 2Å apart. In order to study their arrangements directly, we must use radiation having wavelengths comparable to interatomic distances. X-rays, having wavelengths from about 0.5 to 2.5Å are well suited for this purpose. X-rays cannot be focussed by lenses, but they are scattered by atomic electrons, and a wide variety of information about atomic structure can be obtained by studying these scattered X-rays. This method, the X-ray diffraction method, is used to determine atomic arrangements, interatomic distances and bond angles in crystals; it is also widely used for the identification of crystalline materials and for measurements of particle size, stresses and preferred orientation in crystalline solids.

Elements of Crystallography (See 1. *Crystal Morphology*).—Although X-rays can be used to study matter in any state of aggregation, they are most profitably employed in investigations of crystalline solids. For such investigations, some familiarity with crystallographic nomenclature is essential; a few of the more commonly used terms are defined below:

A *crystal* consists of atoms arranged in a pattern which is repeated regularly in three dimensions. The individual repeat unit may consist of one or many atoms; successive repeat

units are identical in orientation as well as composition. It is often useful to replace each repeat unit by a representative point, a *lattice point*. The collection of lattice points is the *space lattice*, or the *lattice*. A network of parallel lines passing through the lattice points can be shown dividing the lattice into identical parallelepipeds; these are the *unit cells* of the crystal. The crystal may then be thought of as a collection of identical unit cells, stacked in three dimensions.

The arrangement of the lattice points is always the same for a given crystal, but they may be joined in an infinite number of ways. There is a corresponding infinite number of ways of choosing a unit cell; it is only necessary that it contain at least one complete repeat unit of pattern. The actual choice of the unit cell is generally dictated by convenience.

There are only 14 distinct ways in which points can be arranged in space so that all points have identical environments. These are the 14 space lattices. Each space lattice has some convenient set of axes with respect to which atomic locations can be given. Seven different systems of axes are used in crystallography. These form the basis of the seven *crystal systems*: cubic, hexagonal, rhombohedral, tetragonal, orthorhombic, monoclinic and triclinic. If there is only one lattice point per unit cell, the lattice is designated as *primitive*. It is sometimes desirable to refer the crystal to a lattice whose cells contain more than one unit of pattern; in addition to lattice points at the corners, the cells may have lattice points at the centers of some or all the faces. There are seven such centered space lattices.

The fundamental repeat unit of structure often consists of a number of sub-units, identical in atomic composition but differing in orientation. These sub-units are generally related to one another by means of symmetry elements. The symmetry elements are of two types. In one class are symmetry elements, or operations, which leave the point which is operated on unmoved. In three dimensions these include *inversion* about a point, *rotation* about an axis, and *reflection* across a plane. There are altogether 32 ways of combining these symmetry elements in crystals; these are the 32 *crystal classes* or *point groups*. There are, in addition, elements of symmetry which involve translation, as well as rotation and reflection; these are the screw axes and the glide planes. The combination of these elements with the 32 point groups in the 14 space lattices leads to 230 *space groups*. A space group may be viewed as a set of rules whereby the contents of the entire unit cell may be generated from one asymmetric unit of structure. All 230 possible space groups have been listed and described.

The modern nomenclature for the space groups (Hermann-Mauguin) utilizes symbols from which the space group may be directly derived. First is listed the lattice type: P refers to a primitive cell; A, B, C are face centered on the A, B, C, faces respectively; F is centered on all faces, I is body centered. Additional symbols, numbers or letters, refer to the symmetry elements associated with significant crystallographic directions.

If a model of a space lattice is rotated, it can be seen that the lattice points may be considered to lie in sets of parallel planes. Any such set can be identified by the three Miller in-

lices (hkl). Consider any such set of parallel planes. They cut the a , b and c axes into different numbers of parts. If " a " is divided in " h " parts, " b " into " k " and " c " into " l " parts, then the Miller indices of that set of planes are hkl . These same indices are used to denote X-ray reflections from that set of planes.

Geometry of X-Ray Diffraction.—When a beam of X-rays sweeps over an atom, all the electrons oscillate with the frequency of the incident X-rays; secondary "scattered" X-rays of the same wavelength as the incident X-rays are then radiated in all directions. Von Laue has shown that when the scattering units are present in a regular, three-dimensional array, as in a crystal, the scattered X-rays interfere destructively and cancel each other in most directions; in certain special directions there can be constructive interference, the waves may reinforce one another, and strong diffracted beams may be observed.

The relation between the directions of the diffracted beams and the arrangement of scattering units in the crystal is difficult to visualize in terms of von Laue's treatment; it is more readily understood on the basis of a simple model of the diffraction process proposed by W. L. Bragg.

A monochromatic beam of X-rays, of wavelength λ , is considered to be incident, at an angle θ , to a set of parallel lattice planes spaced equal distances, " d " apart in a crystal. (Fig. 1).

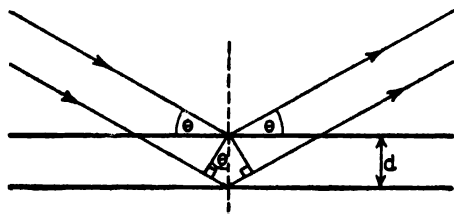


Fig. 1. Bragg's Law.

The path difference for rays reflected from adjacent planes is $2d \sin \theta$. Reinforcement of the radiation reflected from successive planes occurs when the path difference is an integral number, n , of wavelengths, i.e., when $n\lambda = 2d_{hkl} \sin \theta$. This is Bragg's Law.

In general for any arbitrary incident angle, the reflections from successive planes are out of phase with one another; destructive interference occurs and no diffracted beam can be observed. However, θ can be varied by changing the orientation of the crystal relative to the x-ray beam until the conditions for constructive interference are satisfied. The angle between the incident and the reflected beams is then 2θ . The spacings, " d ", of the reflecting planes can be easily computed, using Bragg's Law. These calculations are based on measurements of the directions of the diffracted beams, which are determined entirely by the size and shape of the unit cell. On the other hand, the relative intensities of the reflections depend on the contents of the unit cell, on the number, type and distribution of the atoms in the unit cell.

Atomic Scattering Factor.—We consider, first, the manner in which the scattering power of an atom is built up from the contributions of its electrons, and then the manner in which the diffracted beam is made up from the cooperative scattering by the atoms in the unit cell.

To express the ability of an atom to scatter X-rays, we use the quantity f , the *atomic scattering factor*, which is simply the ratio of the amplitude of the wave scattered by an atom to that scattered by one electron under the same conditions. The atomic scattering factor obviously varies with the number of electrons in the atom. It also varies with angle, decreasing steadily as the angle between the incident and diffracted beams increases. This results from the fact that at small diffraction angles the individual waves scattered from the electrons in the atom are nearly in phase and reinforce one another; they fall more and more out of phase and destructive interference increases, as the angle is increased.

Structure Amplitude.—To compute the total intensity of a reflection, it is necessary to sum up the waves scattered in a given direction from all the atoms. This is equivalent to the problem of adding sine waves different in amplitude and phase, but having the same wavelength, in order to determine the amplitude of the resultant wave. Differences in amplitudes of the individual waves result from differences in scattering power of the various atoms; the relative positions of the atoms along the path of incident and diffracted beams determine the relative phases of these waves. It can be shown that the intensity of the diffracted wave is, in general, proportional to the square of the resultant amplitude. The *structure amplitude*, F_{hkl} , for a given (hkl) reflection, is equal in magnitude to the resultant amplitude divided by the amplitude of the wave scattered by a single point electron for the same wavelength. It is a measure of the efficiency of the set of planes (hkl) in reflecting x-rays.

The value of the structure amplitude can be written as:

$$F_{hkl} = \sum f_j e^{i\phi_j} \quad (1)$$

where the sum extends over all atoms in one unit cell and ϕ_j is the phase of the wave scattered by atom j relative to a wave scattered by an atom at the origin. If the coordinates of the j th atom are x_j, y_j, z_j , where x_j, y_j, z_j are expressed as fractions of the unit cell dimensions, then it can be shown that for a given reflection, (hkl)

$$\phi_j = 2\pi (hx_j + ky_j + lz_j) \quad (2)$$

$$\text{and} \quad F_{hkl} = \sum_j f_j e^{2\pi i (hx_j + ky_j + lz_j)} \quad (3)$$

This can be written as:

$$|F_{hkl}|^2 = \left| \sum_j f_j \cos 2\pi (hx_j + ky_j + lz_j) \right|^2 + \left| \sum_j f_j \sin 2\pi (hx_j + ky_j + lz_j) \right|^2 \quad (4)$$

Equation (3) reduces to a simpler form when the crystal has a center of symmetry which is chosen as the origin of the unit cell, i.e.

$$F_{hkl} = \sum_j f_j \cos 2\pi (hx_j + ky_j + lz_j) \quad (5)$$

Using equations based on (4) and (5) it is possible to compute the intensity of an x-ray reflection (hkl) when the atomic distribution in the unit cell is known.

Reciprocal Lattice.—Corresponding to every real lattice, there is a "reciprocal" lattice, which has the same symmetry as the real lattice and can be referred to the same type of coordinate

axes. The interpretation of X-ray diagrams, particularly those of single crystals, is greatly simplified if the crystal is described in terms of such a reciprocal lattice. To construct the lattice reciprocal to any given space lattice, an arbitrary point is chosen as origin. From it normals are drawn to all sets of direct lattice planes, (hkl). Points are then laid off along these normals at distances K/d_{hkl} from the origin, where K is a constant and d_{hkl} is the interplanar spacing of the planes (hkl). This array of points constitutes a lattice. Each reciprocal lattice point, therefore, represents a set of reflecting planes in the crystal; the indices of the set of planes (hkl) are the coordinates of the corresponding point in reciprocal space. Generally K is taken as unity (sometimes as λ).

The use of the reciprocal lattice makes possible the indexing of diffraction films in a simple, natural way. It also shows clearly the spacings of sets of reflecting planes in the crystal and with the aid of a simple geometrical construction, permits an easy, physical visualization of the process of diffraction by crystals. Consider a sphere that touches the origin of the reciprocal lattice and which has a radius equal to the reciprocal of the X-ray wavelength used (Fig. 2). The diameter, ACO, is parallel to the incident

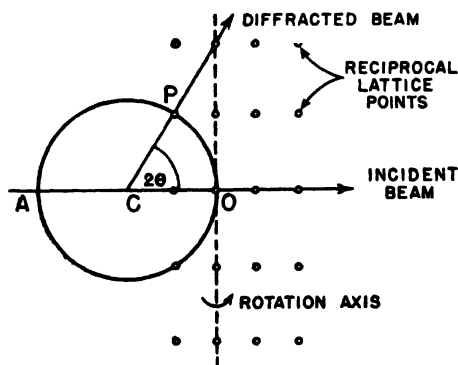


Fig. 2. The sphere of reflection

X-ray beam. It can easily be shown that a set of planes (hkl) will be in reflecting position when, and only when, the corresponding reciprocal lattice point lies on the surface of this sphere. Under these conditions the angle between the lines ACO and CP equals 2θ , and the line CP is the direction of the diffracted beam.

The critical character of Bragg's Law is now apparent. It can be seen that, for an arbitrary orientation of the crystal relative to a monochromatic X-ray beam, no points of the reciprocal lattice will lie on the sphere of reflection and there will be no diffracted beam. As the crystal is rotated, points of the reciprocal lattice pass through the surface of the sphere and the directions of the reflected rays will be from C to the reciprocal lattice points where they pass through the surface of the sphere. It is clear, too, that reflections from crystals with large unit cells and with correspondingly small reciprocal cells, will be close together on the film.

Experimental Methods.—All types of X-ray apparatus have certain characteristics in common: a system of slits (collimators) to define the X-ray beam; means for holding, orienting and rotating the specimen in the X-ray beam; and radiation sensitive devices, usually film or Geiger counters, to record the scattered radiation.

A. The Powder Method.—In the powder method, a small sample containing a large number of small, randomly oriented crystals, is placed in the path of a collimated beam of monochromatic or filtered X-rays (see X-RAY, PHYSICAL NATURE OF). The sample is usually a finely ground powder prepared in the form of a cylinder and mounted with its axis perpendicular to the X-ray beam. When a set of planes in any crystal makes the correct angle with the incident beam to satisfy Bragg's Law, diffraction occurs. The sample (if cylindrical) is generally rotated about its axis during the exposure to ensure maximum randomness of orientation of its component crystallites. These make all possible angles with the incident beam and therefore all possible reflections will occur. For each set of planes with spacing d_{hkl} , there will be a set of diffracted beams describing a cone of half apex angle $2\theta_{hkl}$. The intersection of these cones with the film gives the powder pattern; if a flat film, perpendicular to the X-rays is used, the result will be a series of concentric circles; if cylindrical film is used, the powder pattern will consist of more complicated curves. In place of film, a Geiger counter, or similar device, may be made to traverse a path around the specimen in order to record the scattered radiation; special specimen mounts are generally used in such cases. (See X-RAYS, APPLIED.)

The powder method is used mainly in applied problems, for identification of crystalline solids, for precise measurements of lattice constants and for particle size determination.

Every crystalline substance gives a unique diffraction diagram characterized by the spacings of the lines and their relative intensities. These patterns can obviously be used for identification purposes. All that is needed is a properly indexed catalogue of patterns of known substances, such as the card index of the American Society for Testing Materials, which lists the patterns of about 5,000 compounds. Identification of the components in the sample is accomplished by comparing the d spacings and intensities of lines of the powder pattern with those in the catalogue. X-ray identification of industrial materials by the powder method is extensively used in the metallurgical, ceramic and chemical industries.

In studies of expansion coefficients, phase diagrams and solid solutions, slight changes in lattice dimensions must be followed. In such cases one studies reflections in the "back reflection" region, at Bragg angles close to 90° . It can be seen, from Bragg's Law, that when θ is close to 90° , small changes in " d " (or $\sin \theta$) correspond to large changes in θ . With reasonable care it is possible, using reflections in the back reflection region, to determine lattice dimensions to better than 1 part in 25,000. Very small relative changes are, therefore, easily detected.

The powder method is also used widely in industry for particle size studies. It can be shown that when individual particles are smaller than about 500A in diameter, the diffraction lines become broader. It is possible to determine particle size from quantitative studies of line shapes; this has been done extensively with carbon blacks and a number of catalytic powders.

B. Single Crystal Methods: 1. The Laue Method.—In this method a continuous range of wavelengths is used; generally this is furnished by the output from a tungsten target tube operated at about 50 kv. The collimated beam strikes a stationary single crystal and the dif-

fracted beams are recorded on photographic film. A set of planes will diffract if the angle θ with the incident beam is such that the wavelength λ required by Bragg's Law is contained in the incident beam.

The diffraction pattern is generally recorded on flat photographic film. In the transmission method, a small crystal is used and the film is placed so that the crystal lies between it and the X-ray tube. In the back reflection Laue method, the film is placed between the tube and the specimen, the collimator passing through a hole cut in the film.

The latter method is widely used in determining the orientation of single crystals, especially those belonging to the more symmetrical systems. In back reflection Laue patterns of such crystals the symmetry of the pattern is often readily recognizable; adjustment of the crystal to achieve proper alignment is then easily made. The method is particularly useful in studies of crystals of metals and alloys, many of which crystallize in the cubic and hexagonal systems.

2. Rotation and Oscillation Methods.—In the customary rotation or oscillation single crystal techniques the crystal is mounted so that the axis of rotation is parallel to a crystallographic axis, i.e., parallel to a line of lattice points. Normal to any crystallographic axis there is, in the reciprocal lattice, a set of parallel planes of reciprocal lattice points. As the crystal rotates the reciprocal lattice rotates about an axis which is parallel to the crystal rotation axis and which passes through the origin of the reciprocal lattice. Layers of reciprocal lattice points will intersect the sphere of reflection in parallel circles. The directions of the reflected beams are from C (Fig. 2) to points in the circles. The reflections will be the elements of a series of right circular cones. If a cylindrical film, coaxial with the rotation axis, is used to record the reflections, the intersections of these cones with the film cylinder will be a series of parallel circles. When the film is straightened the reflections lie on a series of parallel, straight "layer lines." If a flat film is used, the layer lines will be a series of hyperbolae. The periodicity along the rotation axis can be readily computed from the separations of these layer lines. Indexing of reflections on layer lines is greatly simplified if the crystal is oscillated through a limited angular range (often 15°) in place of complete rotation. Adjacent regions of reciprocal space are recorded on successive films; each photograph contains relatively few reflections.

3. Moving Film Methods.—Indexing of single crystal diagrams is simplified further if moving film methods are used. The Weissenberg and precession methods are the most widely used. These are designed to record one layer of the reciprocal lattice at a time; this is achieved by screening out all but one layer of reflections with the aid of a metal screen having a slot set to pass only one layer line from the crystal to the film. In both methods the motions of the crystal and film are ingeniously coupled; the Weissenberg X-ray pattern is a slightly distorted version of the reciprocal lattice layer; on the precession photograph the reciprocal lattice layer appears in completely undistorted form.

Crystal Structure Determination.—It has been shown that it is possible to compute the amplitudes and therefore the intensities of reflec-

tions to be expected from any assumed structure. Many simple structures have been solved by this "trial and error" method; reasonable structures are assumed on the basis of chemical and physical considerations concerning atomic sizes and probable molecular configurations. The structure which gives best agreement between observed and computed intensities is considered the correct structure.

Clearly, this "trial and error" method can be used only for very simple structures. To determine crystal structures of greater complexity, an elegant method is available: the method of Fourier series. The electron density, ρ , in a crystal is a periodic function in space. It can therefore be represented by a three dimensional Fourier series as follows:

$$\rho(x,y,z) = \text{constant} \times \sum_{-\infty}^{\infty} \sum_{-\infty}^{\infty} \sum_{-\infty}^{\infty} F_{hkl} e^{-2\pi i(hx+ky+lz)}$$

where x,y,z are the coordinates of any point in the unit cell and F_{hkl} are the amplitudes of the various (hkl) reflections. These are proportional to the square roots of the reflection intensities.

The Fourier expression and the consequent calculations are simplified if the crystal has a center of symmetry at which the origin of the unit cell is placed. Even in this favorable case the summation of a Fourier series for an average crystal is a formidable task and, in recent years, many electronic computers have been designed to perform these calculations.

The results of a Fourier summation are generally plotted by using contour lines; the plot resembles the usual topographic contour map, the peaks representing regions of high electron density, hence atoms.

One major difficulty is inherent in the Fourier method of crystal structure determination. The experimental data consist of X-ray intensities; these are quantities proportional to $|F|^2$. From these we can only determine the absolute magnitudes of the Fourier coefficients. However, $|F|$ is, in the general case, a complex number (eq. 6), and even in the centrosymmetrical case, it is a number whose sign is either plus or minus. To perform a Fourier summation successfully, an approximate knowledge of the structure is generally needed. This can be used to compute the phase angles or signs of the Fourier coefficients which then can be used to compute the Fourier series.

Lacking such advance knowledge of the phase angles (which may be based on comparisons with known structures of similar substances or perhaps a good guess) the Fourier expressions for electron density cannot be used and recourse must be had to other methods of analysis. These are discussed in detail in the works listed in the bibliography.

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BENJAMIN POST,
and

I. FANKUCHEN,
Brooklyn Polytechnic Institute, Brooklyn, N. Y.

CRYSTALS, Synthetic. A crystal grows by the orderly accumulation of the atoms of which it is composed. In a single crystal a given arrangement of atoms is repeated many thousands of times, always parallel to itself, like the pattern in wallpaper, but in three dimensions. This orderly accumulation has gone on under a wide variety of conditions in nature. Nearly all rocks are composed of crystals, large in coarse-textured rocks, small in fine. When crystals grow in the laboratory under conditions provided by man, they are called synthetic crystals. They may be more or less perfect than crystals of the same substance grown in the earth's crust, depending on the extent to which conditions favorable for their growth have been provided in the two cases. Many crystals grown in the laboratory are never found in nature.

The scope of this article is limited to consideration of single synthetic crystals, since a discussion of synthetic crystallization of polycrystalline bodies would involve such wide fields as, for example, the manufacture of cement, steel, paint and pottery.

When a single crystal grows, it nearly always develops smooth, planar faces whose angular relation to each other is governed by the regular arrangement of the atoms of the crystal. These angles are therefore always the same for a given substance although the relative sizes of the faces may vary from crystal to crystal. Usually crystals of a given substance will be similar in "habit" or proportions, that is, they will all be platy or all needle-like or all equi-dimensional. However, by varying the conditions of growth, this habit can be markedly changed (though the interfacial angles must, of course, remain unaltered). The reader is referred to the work of H. E. Buckley and others for many interesting habit modifications.

History.—Synthetic crystals were described in the 18th century by Domenico Guglielmini in his work (published 1705) on the shapes of crystals formed by evaporating solutions of

salts in the laboratory, but the effort to produce a crystal as an end in itself probably began in the 19th century with the work of such versatile experimenters as Senarmont, Hautefeuille, Mari-gnac and von Rammelsberg.

Demand.—There is considerable theoretical interest in the conditions and processes of crystal growth on the part of geologists, chemists and physicists, but, in addition to this, there is a two-fold demand for the finished product.

First, single crystals are needed for research. As we come to learn more about the physical and chemical properties of substances (e.g. electrical conductivity, magnetism, optical properties, chemical reactivity, and the variations of these with pressure and temperature) we find that a full understanding of most of them necessitates measurements made on single crystals since these properties vary according to the crystallographic direction in which they are measured. A measurement on a polycrystalline sample thus gives an averaged value which is more difficult to interpret. Natural crystals (minerals) can sometimes be used, but are more likely to have grown under changing pressure, temperature and chemical environment than are crystals grown under controlled conditions in the laboratory.

Second, largely as a result of this single-crystal research, there is a rapidly growing demand for single crystals for industrial applications, some of which are listed in Table 1. This has resulted in large scale production of some crystals. During World War II one manufacturer was growing ammonium dihydrogen phosphate in lots of 31,360 crystals at a time. In forty days each of these reached a length of 9 inches with a cross-section about $1\frac{3}{4}$ inches square. They were then "harvested" and another lot was started from seed plates $\frac{1}{4}$ inch thick and $1\frac{3}{4}$ inches square. At the end of the war, the Linde Air Products Co. was producing nearly a thousand pounds of synthetic sapphire crystals a month, from which about two million jewels could be cut for bearings.

Techniques.—The goal of producing a large,

Table 1—SOME USES FOR WHICH SYNTHETIC CRYSTALS ARE GROWN

<i>Useful Property</i>	<i>Applications</i>	<i>Examples</i>
Piezoelectricity (electrical charge resulting from mechanical strain, and vice versa.)	Frequency control in radio communication. Detection of underwater sound. Phonograph pickups.	Quartz (SiO_2) "EDT" (ethylene diamine tartrate) "ADP" ($\text{NH}_4\text{H}_2\text{PO}_4$) Rochelle salt
Ferromagnetism (spontaneous magnetic polarization)	Memory devices (such as tape recorders) Coil cores	Iron, nickel, cobalt. The ferrites of iron, nickel, cobalt, etc
Ferroelectricity (spontaneous electric polarization)	Memory devices	Barium titanate (BaTiO_3)
Hardness	Jewels (watch bearings, etc.) Thread guides Phonograph needles Ball-point pens.	Ruby and sapphire (both Al_2O_3)
High index of refraction and dispersion of visible light (also hardness)	Gem-stones.	Ruby and sapphire, including star varieties. Rutile. Emerald
Transmission of ultra-violet and infra-red light.	Prisms and lenses for spectrometers.	Silver chloride (AgCl) Halite (sodium chloride, NaCl) Potassium bromide (KBr) Lithium fluoride (LiF)
Low electrical conductivity and chemical and physical stability	Electrical equipment.	Mica.
Semi-conductivity	Rectifiers. Transistor devices of all sorts.	Germanium. Silicon. Lead sulfide.
Bombardment-induced luminescence	Scintillation counters.	Anthracene Calcium tungstate.

perfect single crystal may be resolved into four parts: (1) to get a relatively small, perfect single crystal, or "seed"; (2) to cause additional atoms (or ions or molecules) to attach themselves to the seed at as rapid a rate as is consistent with their assuming a completely orderly arrangement continuous with that of the seed; (3) to avoid the inclusion of any "foreign matter," which refers not only to gas, liquid or solid of a composition other than that of the crystal, but to matter of the same composition, differently oriented or arranged; and (4) to avoid the formation of additional crystals which may use up material intended for the main crystal or crystals, or may become attached to them in a misoriented position.

A classified list of techniques that have been used for achieving crystal growth appears in Table 2. It can hardly be comprehensive since the various modifications of techniques are about as numerous as the individuals who use them.

The choice of a suitable technique depends on the properties of the substance to be grown. For example, if the substance melts at an attainable temperature without decomposition, excessive

Table 2. TECHNIQUES FOR GROWING CRYSTALS

- A. From a melt of the substance to be crystallized
 1. Obreimov—Schubnikov—Bridgman Stockbarger technique.
 2. Czochralski—Kyropoulos technique.
 3. Zone melting techniques.
 4. Verneuil method or flame-fusion technique.
- B. From a melt with the aid of fluxes, non-aqueous solution

Examples: The growth of barium titanate, diamond (?)
- C. From very hot aqueous solutions Hydrothermal techniques.

Examples: The growth of quartz, mica, tourmaline, beryl.
- D. From solutions at moderate temperatures.
 1. At constant temperature
 - a. By decreasing the amount of solvent by evaporation.
 - b. By increasing the amount of solute
 2. By varying the temperature to decrease solubility.

Examples: The growth of Rochelle salt, ADP, EDT (See Table 1)
- E. From the vapor state.
- F. By chemical decomposition.

Example: Koref hot-wire technique.

evaporation, or reaction with the container or the atmosphere provided for it, then it may be possible to crystallize it directly from a melt purely of its own composition. Even if it meets all the above requirements, but undergoes a destructive structural transformation or phase change between the temperature of solidification and cooling, the pure fusion technique will be unsuitable.

Addition of suitable fluxes may markedly lower the melting point, but, introduce the danger of contamination of the crystal produced. Even water molecules may act as contaminants in crystals grown from aqueous solutions. It is well known that large clear sodium chloride crystals may be grown from fused sodium chloride whereas those grown from aqueous solutions of sodium chloride are clouded with many fine fractures. One explanation offered for this difference is that water molecules included in the crystals cause structural distortion that ultimately results in fracture.

The following descriptions of the techniques listed in Table 2 are intended to acquaint the reader with the major features of each technique and not to serve as instructions for the process.

For these the reader must consult the original references, listed in the bibliographies which will be found in references at the end of this article

A. From a melt of the substance to be crystallized

1. In the *Obreimov—Schubnikov—Bridgman—Stockbarger technique* the melt is in a long narrow container whose bottom tapers to a point. Cooling is begun here with the hope that only one seed will be initiated. Its growth then proceeds as cooling is allowed to proceed slowly along the container. A steep temperature gradient is desirable to prevent formation of unwanted seeds.
2. In the *Czochralski—Kyropoulos technique* a seed crystal is gradually withdrawn from the surface of the melt with which it remains in contact due to growth.
3. *Zone-melting* is a technique which has been used for purification or for distributing desired impurities in special ways in a crystal. It is the process of moving a short molten zone or zones through a relatively long solid mass. It makes use of the difference in distribution of the impurities, wanted or unwanted, in the solid and in the liquid.
4. In the ingenious *Verneuil method*, originated by A. Verneuil at the end of the 19th century for the growth of Al_2O_3 gems (chiefly ruby and sapphire), the finely powdered source material is fed into the oxygen stream of an oxy-hydrogen blow torch directed downward toward the support on which the crystal is to be grown. The support is withdrawn as the crystal "boule" grows. The diameter of the boule is governed by the supply of oxygen and is made very small at some early stage of growth, as to achieve a single crystal seed. The sapphires and rubies grown by this technique can be distinguished from those grown in nature by microscopic examination since in the natural stones the distribution of minute inclusions tends to be planar, parallel to planar layers of atoms whereas, in the synthetic crystals the inclusions lie parallel to the curved surfaces of the boule.

Star sapphires and rubies are made by the addition of small amounts of an impurity which forms sub-microscopic inclusions in the crystal. Heat treatment subsequent to growth is commonly part of the process. These inclusions are oriented along six crystallographically equivalent directions in the crystal which, when properly cut and polished, shows a "star" of scattered light.

B. From a melt with the aid of fluxes. The melting point of a substance may be lowered by the presence of other substances, sometimes called fluxes. The resulting liquid mixture is properly termed a solution. An example of crystal growth from such a solution is that of barium titanate. The finely powdered material is thoroughly dissolved in molten potassium fluoride (KF) in a platinum crucible which is then slowly cooled. The resulting platy crystals of barium titanate are readily separated from the finally solid potassium fluoride because the latter is water soluble whereas the barium titanate is not.

Synthetic diamonds have been reported several times, but attempts to repeat the experiments described have not met with success. There is thus at present no known method for the reliable production of diamonds. Greatest credence is accorded to the account by J. B. Hannay. Hannay placed a mixture of rectified bone oil and "paraffin spirit" with some metallic lithium in a sealed container which he heated to dull red heat for 14 hours, then cooled slowly. He reported the formation of diamonds and the crystals in the British Museum which are labelled as the results of his experiments have been proven to be diamonds, but his experiments have been carefully repeated with no success.

On the basis of thermodynamics it has been shown that the diamond is stable only at high temperatures and pressures. Its persistence outside of its thermodynamic stability range is due to the structural stability of the strong carbon-carbon bonding in the diamond structure (See article on *Chemical Crystallography*). This does not mean that there is no chance of growing the diamond at moderate temperatures and pressures since a metastable state occurs spontaneously in many chemical processes.

C. From hot aqueous solutions. Many of the largest and best natural crystals are believed to have grown from hot aqueous solutions, probably containing potassium, aluminum, silica and carbon dioxide and probably under more than atmospheric pressure. Similar conditions can be created in the laboratory in sealed steel containers called autoclaves. An example of this technique of hydrothermal synthesis is the growth of quartz. In one method fragments of quartz are put in the bottom of a silver-lined autoclave and one or more seed crystals are suspended above from a silvered frame. The autoclave is then nearly filled with a dilute alkaline solution, sealed and heated at the bottom to about 400°C. for several weeks.

The suspended crystals in the cooler part of the container grow at the expense of the broken source material in the bottom.

D. *From solutions at moderate temperatures.* In the following discussion all the examples are crystals grown from water solutions, but it should be understood that the techniques are applicable to crystallization from other solvents where these are appropriate.

1. *At constant temperature:* (a) Anyone can grow small sodium chloride crystals from a salt solution in an open vessel by allowing the water to evaporate. This technique of crystal growth is often used to get a small perfect seed of a water soluble crystal for use in later, better controlled techniques. (b) The alternative constant temperature technique is to add solute at a rate commensurate with its removal from solution by crystal growth. In an apparatus using this technique four 43-pound ADP crystals were grown in a period of four months.
2. *By varying the temperature to decrease solubility.* Most water-soluble substances become less so with decreasing temperature; a few become more so. By appropriately varying the temperature of the

prerequisite may be obtained either by the Crochalski technique or by annealing a suitably cold-worked wire. Vaporized tungsten chloride (WCl_6) and hydrogen are passed over the wire which is heated by an electric current to about 1000°C . The heat from the wire causes the gases to react with each other producing tungsten which adds to the girth of the wire and hydrogen chloride which is carried away as a gas. Since the resistance of the wire decreases as its diameter increases, the current through the wire must be increased to keep it hot as it grows. The maximum obtainable current places a limitation on this process.

Theory.—A discussion of the theory of crystal growth is beyond the scope of this article. Although the subject has been an attractive one for growers of synthetic crystals, chemists and physicists, from Willard Gibbs' thermodynamic attack on it to the Burton, Cabrera and Frank school of the present day, full understanding has not yet been achieved. Verma's beautifully illustrated little book is recommended to those interested in the present theory of growth by spiral dislocations. In spite of the recently accelerated progress in theory and experiment, the art of growing large crystals is still in that state of incomplete understanding which makes each new problem one to be solved, not alone by knowledge of the prior art, but with the aid of ingenuity and imagination.

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ELIZABETH A. WOOD,

Research Staff, Bell Telephone Laboratories.

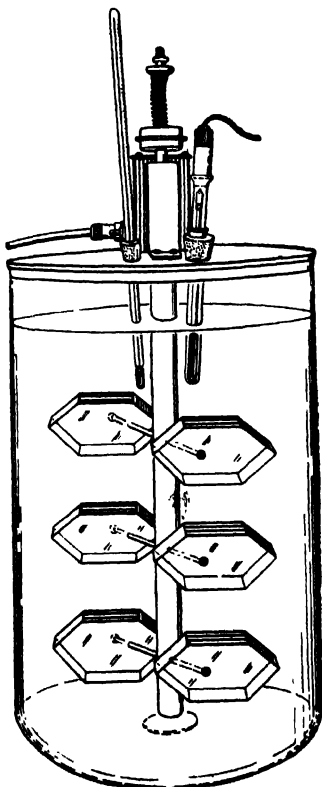


Fig. 1. Reciprocating rotary crystallizer with EDT crystals.

saturated solution the solute may be deposited on a seed crystal. A crystallizer using this technique, devised by A. N. Holden, is shown in Fig. 1. During the lowering of the temperature the seed crystals, fixed to the arms of a rotating spider, are swept through the solution, first clockwise, then counter-clockwise, ensuring a fresh supply of solute for the crystal growth and avoiding the concentration furrows and irregular shape of crystals that grow with no motion relative to the solution. There is double protection against unwanted seeds. Evaporating water condenses on the cool metal lid and drips back onto the surface, thus preventing seeding which might otherwise occur there and any seeds that do form in the container are swept to the center of the bottom by the vortex motion. Here a small, low-power heater, warming just this region of the solution, causes them to be redissolved.

E. *From the vapor state.* Crystals grown by direct crystallization from the vapor state have, for the most part, been very small. They are commonly needlelike.

F. *By chemical decomposition.* Koref's hot wire technique is an example of crystal growth by chemical decomposition. The single-crystal tungsten wire which is a

CSABA, chō'bō, or **BEKESCSABA**, bā'kash-chō-bō, city, Hungary, in, but independent of, Bekes County; 53 miles northeast of Szeged. An agricultural and marketing center, its manufactures include textiles, furniture, machines, shoes, and boxes. The city lost much of its surrounding area in 1950. Pop. (1941) 52,404.

CSONGRAD, chōng'grād, city, Hungary, a market town, capital of a county of the same name, at the junction of the Körö with the Tisza, 72 miles southeast of Budapest. The surrounding country is very flat and has excellent pastures. The chief occupations are cattle-raising, agriculture, wine-making and fishing. Pop. (1941) 25,594.

CTENOID, tē'noid (Gr. "comblike"), applied to the scales of fishes when jagged or pectinated on the edge like the teeth of a comb, as in the perch, flounder and turbot.

CTENOPHORA, tē-nōf'ō-rā, a phylum of animals, sometimes grouped under the Coelenterata (q.v.), but distinguished from them by the absence of stinging cells and the presence of a third germinal layer. They also possess comb-like bands of cilia which serve them for

locomotion. Being very abundant, marine, jelly-fishlike animals, they swim by means of eight meridional bands of transverse, comblike plates.

CTESIAS, tē'zī-ās, Greek physician and historian: fl. 5th century B.C. In 415 B.C. he was captured by the Persians and lived for 17 years as a physician at the court of Artaxerxes Mnemon of Persia. It was here that he wrote, among other works, the *Persica*. According to Diodorus, this work of Ctesias was derived from the Persian royal archives and was intended to discredit the history of Herodotus. All that remains of the history of Ctesias is an abridgment in the writings of Photius and the fragments that are contained in the works of Diodorus, Plutarch, and other historians.

CTESIBIUS, tē-sīb'ī-ūs, Greek physicist and inventor: fl. 2d century B.C. He lived at Alexandria and, with the influence of Ptolemy II (Ptolemy Philadelphus) and Ptolemy III (Ptolemy Euergetes), became famous for his mechanical inventions. With his pupil Hero of Alexandria, Ctesibius is credited with the discovery of the expansive power of air and its application as a motive power. Specific inventions included the force pump, water clock, bent syphon, and fire engine.

CTESIPHON, tēs'ī-fōn, Greek orator: fl. 4th century B.C. He was a citizen of Athens and was prosecuted by Aeschines for a proposal that Demosthenes be given a gold crown for his distinguished work. He was defended by Demosthenes, and their orations for this occasion, referred to as *On the Crown*, are praised as two of the great Greek orations.

CTESIPHON, tēs'ī-fōn, ancient ruined city in Iraq, on the east bank of the Tigris opposite Seleucia and 20 miles south-southeast of Baghdad. It was the capital of the ancient kingdom of Parthia and of the later Sassanid empire. There are ruins of a magnificent vaulted hall of the Sassanid period. Ctesiphon was captured by the Romans in 115 A.D. and by the Arabs in 637 A.D. After Baghdad became the capital of the Abbassid caliphate in the 8th century the city became deserted. On Nov. 21, 1915, during World War I, British forces under Gen. Charles Townshend were defeated here by the Turks and compelled to retreat to Kut-al-Imara (Kut-el-Amara).

CUANZA or **KWANZA**, kwān'zā, river in Angola, southwest Africa, rising in the south central part of that Portuguese colony and flowing in a northwesterly direction to enter the Atlantic Ocean just south of Luanda (São Paulo de Loanda). The length is about 500 miles. It is navigable for small vessels until falls are reached 160 miles from its mouth.

CUAUTLA, kwou'tlā, town, Mexico, in the state of Morelos 18 miles southeast of Cuernavaca. It is a popular resort because of its hot sulphur springs; they were frequented by the Indians even before the Spanish conquest. Here, during the revolution in 1812, José María Morelos y Pavón, Mexican priest and patriot, withstood for three months a siege by royalist forces under Félix María Calleja del Rey. A century later the town was the center of the revolutionary

activities of Emiliano Zapata. Pop. (1940) 6,431

CUBA, a republic and largest island of the West Indies. Its western end projects into the Gulf of Mexico and is separated from the United States by the Florida Strait and from Mexico by the Yucatán Channel. The eastern end is also separated by channels from the Bahamas to the north, and Jamaica to the south, while to the east the island is separated from Haiti by the Windward Passage. It lies just below the Tropic of Cancer, within longitudes 74° 2' and 84° 59' west of Greenwich and between 19° 48' and 23° 12' north latitude. This privileged strategic position, dominating the three sea lanes between the Atlantic, the Gulf of Mexico, and the Caribbean, gave Cuba the name of "the Key to the New World." The main island, narrow and arching northward to a point only 90 miles from Key West, Fla., is 760 miles long. Its width averages 60 miles, ranging between 25 and 124 miles. Its total area including the Isle of Pines and other adjacent small islands is 44,164 square miles, or about the size of Pennsylvania, and its population (1943) was 4,778,583. Havana (Span. Habana, pop. 676,376) is the capital city. The monetary unit is the peso, on a par with the U.S. dollar, and the metric system of weights and measures is used. The flag of Cuba is formed by a lone star in a red triangle, from two sides of which flow five alternately blue and white horizontal stripes. The national anthem is the *Himno Bayamés*.

The various topics discussed here are:

The Land	Government
Political Divisions, Chief	Way of Living
Cities, Population	Education
The People	Press
Natural Resources	Radio
Agriculture	Architecture
Sugar Industry	Painting and Sculpture
Manufacturing Industries	Music
Labor Relations	Literature
Trade	Science
Transportation and Com-	Medicine and Public Health
munication	History
Economic and Financial	
Factors	

The Land.—About one half of Cuba consists of flat or rolling terrain, while the remainder is hilly or mountainous. There are three distinct groups of mountains. In the westernmost province, Pinar del Río, the Sierra de los Organos extends from Cape San Antonio to the boundary line of Havana Province, reaching a height of 1,800 feet. The range extends eastward along the north coast of the four central provinces in the form of lower, disconnected hills. In the extreme eastern end of the island, it forms the impressive landscape around Baracoa and Sagua de Tánamo, famous for its natural wonders. Southeast of Baracoa the range reaches an altitude of 4,020 feet. The Guamuhaya Range occupies a limited area in the southern part of Las Villas (formerly Santa Clara) Province, between Cienfuegos and Trinidad. Its highest summit is 3,792 feet above sea level. The third mountain system is that of the Sierra Maestra extending eastward from Cape Cruz along the southern coast of Oriente Province and including the Sierra del Cobre and Macaca ranges. Rising precipitously from the Caribbean Sea, these rugged and majestic mountains hem in the landlocked harbors of Santiago de Cuba and Guantánamo. Pico Turquino (7,870 feet) in the Sierra Maestra is the highest elevation on the island. Thus all of the northern coastal regions and the

southern coast as far west as Cape Cruz are mountainous or hilly. Between these ranges are a number of extremely fertile plateaus and valleys. A long stretch of coast on the Caribbean Sea, especially the southern part of Las Villas and Matanzas provinces, is comparatively low-lying and swampy. South of Matanzas lies the great Zapata swamp.

Sixty miles off Batabanó on the southwestern coast is the Isle of Pines (1,180 square miles), once claimed by the United States but relinquished to Cuba by the treaty of March 13, 1925.

All parts of Cuba are within comparatively easy reach of the coast. Numerous good harbors are evenly distributed along the northern coast and the mountainous sections of the southern shoreline. The rivers are for the most part too short and too rapid for navigation. The longest is the Río Cauto, in Oriente Province, which runs 150 miles westward into the Gulf of Guacanayabo, and is navigable for one third of its length. A number of the streams disappear into subterranean channels cut through white limestone.

The climate is semitropical. Temperatures are slightly higher at the eastern end of Cuba than at the western extremity, but due to prevailing winds and the east-west axis of the island, the climate is moderate and relatively uniform. There are two distinct seasons. From May to October is warm and rainy, while the cool, dry season extends from November to April. The average yearly rainfall is 50 inches on the northern coast, 45 on the southern coast, and 60 in the interior. The temperature ranges between extremes of 60° and 98° F. The annual average temperature at Havana is 77°.

Political Divisions, Chief Cities, Population.—Corresponding to tradition and geographical lines, Cuba is divided politically into six provinces as follows:

	Area in square miles	Population 1943	Population per square mile
Pinar del Río.....	5,206	398,794	76.6
Havana (Habana).....	3,170	1,235,939	309.9
Matanzas.....	3,256	361,079	110.9
Las Villas.....	8,257	938,581	113.6
Camagüey.....	10,064	487,701	48.5
Oriente.....	14,211	1,356,489	95.5
	44,164	4,778,583	108.2

The basic political unit of the country, however, is the municipality. The following table lists the cities with over 100,000 population:

City	Province	Population 1943
Havana *	Havana	676,376
Holguín.....	Oriente	171,997
Camagüey *	Camagüey	155,827
Marianao.....	Havana	135,815
Santa Clara *	Las Villas	122,241
Santiago de Cuba *	Oriente	120,577
Sancti Spiritus.....	Las Villas	104,578

* Capital of the province.

Havana, also the capital of the nation, is the principal seaport and the economic and cultural heart of the country, as well as, by far, the largest city. Including suburbs, its population exceeds 800,000.

The total population of Cuba has risen steadily since early colonial times, except for the brief period during the war of independence, as demonstrated by the following table:

1774.....	171,620	1919.....	2,889,004
1827.....	704,487	1931.....	3,962,344
1877.....	1,631,687	1943.....	4,778,583
1899.....	1,572,797		

However, the average yearly increase in population between 1931-1943 amounted only to 1.7 per cent whereas from 1919-1931 it was 3.1 per cent. This marked decline can be readily accounted for by government restrictions on immigration after 1931. A slight decrease in the birth rate was also registered, but this can be attributed to the economic and political crisis which marked the early part of that period, rather than as a permanent trend. Taking the above factors into consideration, a continued increase in the population may be expected in the near future, though at a much lower rate than in the past, unless immigration restrictions are lifted.

In 1943 the population was divided into 54.5 per cent urban and 45.5 per cent rural, showing an increase of 3.2 per cent over 1931 in the urban population with respect to the rural. This was due both to an increase in the number of urban centers and to a greater concentration of population in the larger cities. The trend will probably continue in view of the increasing industrialization. See also separate articles on chief cities.

The People.—According to the 1943 census figures, the population of Cuba is divided approximately into 70 per cent white and 30 per cent colored or of mixed blood. This shows an increase in the proportion of whites since the establishment of independence in 1902. According to the census taken in 1899 during the United States occupation, the proportion was 60 per cent white and 40 per cent colored. The increase is fully accounted for by white immigration in the intervening years.

During the first 30 years of the republic (1902-1932) 1,261,788 immigrants entered Cuba, of whom 760,000 were Spaniards, 189,866 Haitians, 120,989 Jamaicans, and 33,602 United States citizens. Most of the latter were transients, and in 1943 less than 10,000 were residing in Cuba. The colored immigrants represented by the Haitians and Jamaicans were, in great part, workers contracted each year for the sugar harvest, and required to return to their countries at the harvest's end. In 1933 and 1934 the Cuban government rounded up and repatriated most of those who had illegally remained. There was thus a surplus of white immigration exceeding 600,000.

The proportion of the white and colored population in the past has also depended on the character of immigration. White immigration began in 1511 with the conquest and settlement of the island by Spain. The importation of Negro slaves from Africa followed soon after because of the rapid extinction of the native Indians and Spain's prohibition to enslave those who remained. In the 16th and 17th centuries both white and colored immigration was limited by Spanish colonial policy, the total population increasing very slowly. But during the latter part of the 18th century and the beginning of the 19th, owing to the expansion of the sugar industry, the slave trade received a great impetus. As a result, the total Negro population, both slave and free, rose to outnumber the white for a short period. With the abolition of slave trade and succeeding waves of Spanish immigration, before as well as after independence, the trend was reversed and the proportion of whites rose steadily.

Assuming immigration restrictions are maintained, no marked changes may be expected in the near future as to the proportion of whites and Negroes.

During the critical years of 1933-1937 not only was there a stoppage of immigration but a net outward balance of 54,090 was registered. With the return of normal conditions, however, this emigrant movement has been checked.

The vast majority of the white population is of Spanish descent or of Spanish birth. The latter class will, of course, disappear in time unless there is new immigration. The Cuban-born children of Spaniards are immediately assimilated and are indistinguishable from other white Cubans. Among the colored population there is a small segment of Chinese and some traces of the aboriginal Indians.

The language of the country is Spanish and the culture is essentially Spanish, though naturally they have both undergone some change upon being transplanted to the Western Hemisphere, similar to that undergone by the English language and culture in the United States. The Negroes, in particular, have contributed a characteristic emotional influence largely revealed in music. The colored race has also produced several fine poets and plastic artists. Antonio Maceo, one of the great leaders of the War of Independence, was a mulatto.

The relations between the races are particularly happy in Cuba. There are no legal or political discriminations of any kind. Though social prejudice against Negroes undoubtedly exists, it is not manifested by any public measures, nor does it prevent recognition of personal ability. The existence of a large mulatto population, outnumbering the full-blooded Negroes and tending to increase, points to continual miscegenation, but this does not seem to present any very serious problem. All in all, Cuba is an outstanding example of racial democracy.

Natural Resources.—Minerals.—The Cuban subsoil is rich in minerals, still only partly exploited, although during World War II mining activities were greatly stimulated owing to United States war production demand. The most important minerals from the viewpoint of development and export are manganese, copper, iron, chromium, nickel, and asphalt. Other minerals include gold, silver, mercury, zinc, lead, barium, antimony, sulphur, coal, asbestos, marble, and petroleum.

Cuba ranks fourth in the world in iron ore deposits, but only 20th with respect to extraction. Of the more than three billion tons estimated to exist, one United States company owns the rights to 90 per cent, reducing extraction operations to a minimum and holding the rest as a reserve for the future. The deposits are located in the Moa Sierra, Oriente Province. In manganese production Cuba ranks second to Brazil in the Western Hemisphere.

There are conflicting opinions with respect to the existence of deep oil deposits in Cuba. Reports of petroleum companies during 1945 were more promising than in previous years. Up to 1946 surface deposits of light gravity oil had been discovered in the Jarahuca district and naphtha, or natural gasoline, in the Motembo area in Matanzas and Las Villas. In 1945 light gravity oil, produced by numerous small companies, totaled 4,000,000 gallons, compared with approximately 600,000 gallons during the previous year. Production of naphtha declined in the Motembo area from 4,000,000 gallons in 1944 to 2,350,000 in 1945.

Production of copper and refractory chromite

in 1945 maintained its high wartime rate, while the large United States sponsored nickel oxide plant in Lengua de Pájaro, Oriente, in that same year, reached its full production capacity. Manganese and metallurgical chromite production, however, declined sharply when the United States government procurement program terminated with the war's end. The Cuban American Manganese Corporation and the Nicaro Nickel Company, both subsidiaries of the Freeport Sulphur Corporation, practically put an end to their activities in 1946. On the other hand, as a result of the discovery of additional copper ore reserves, production of copper concentrates increased. Output in 1945 amounted to 26,610 long tons. Compared with 21,830 in 1944. Practically all the ore goes to the United States.

Forests.—Although much valuable forest land was destroyed to make way for the expanding sugar industry, about one tenth of Cuba's area is still covered by forest. There are many hardwoods, chief of which are mahogany, cedar, ebony, *lignum vitae*, and *majagua*. Mahogany is exported, cedar is used for cigar boxes and pencils; both are also used for cabinetwork. The total value of forest products in 1944 was put at \$5,800,000.

Fisheries.—The value of fishing products in 1944 was estimated at \$6,000,000. Edible fish products are almost all domestically consumed. Batabanó, on the southern coast of Havana Province, is the center of one of the largest sponge industries in the world. Sponge exports in 1945 were valued at \$548,233.

Agriculture.—Of the total employed persons in Cuba in 1943, 41.1 per cent were engaged in agriculture, cattle raising, and fishing, which compares with 18.8 per cent in the United States, showing clearly the vital importance of these activities in the national economy. The cultivation of sugarcane constitutes the basis of the whole Cuban economic structure. But it is so inextricably bound up with the industrial process of the extraction of sugar and its derivatives and is involved with so many complex social and political factors, that it is dealt with in the separate section *Sugar Industry*.

To combat the evils of a one-crop economy, the Cuban government has actively encouraged the diversification of agriculture. The valleys and plains of Cuba possess extremely fertile soils which, due to the equable climate, yield crops the year round. Next to sugarcane, though far below it in value, the chief agricultural products in order of their importance are: tobacco, fruits and vegetables, coffee, henequen fiber (used mainly for rope), and corn (for domestic consumption only). Cacao, rice, honey, beeswax, and cotton are also produced.

Tobacco.—The tobacco plant is indigenous to Cuba; its use was known to the Indians before the Spanish discovery. The highest grade tobacco, known the world over as pure Havana, is grown in the Vuelta Abajo district of Pinar del Río Province, in a relatively small zone near San Juan y Martínez. It is sold both internally and to foreign markets, either in the leaf or, after a manufacturing process, as finished tobaccos, cigarettes, and cigarette fillings. In 1945 the tobacco crop amounted to 67 million pounds and was further expanded in 1946. Domestic consumption absorbs about 40 per cent. The total value of tobacco and tobacco products exported in 1945 amounted to \$50,400,000; 56 per cent of

the crop was sold to the United States. World War II brought big reductions in the British and Spanish markets, and Argentina took Spain's place as the second largest importer.

Fruits and Vegetables.—Aside from the citrus fruits and well-known tropical fruits such as bananas, pineapples and avocados, there are many others not suitable for export which are consumed domestically, among them mangoes, mammee and sweetsop. Practically all vegetables grown in temperate climates are also grown in Cuba. The year 1945 was a bad one for agricultural exports owing to severe drought and shipping difficulties. Nevertheless, about 60 million pounds of fresh pineapples, valued at \$2,000,000, and approximately 2,300,000 bunches of bananas, valued at \$1,700,000, were sold to the United States. A considerable amount of vegetables are exported during the winter months to the United States.

Coffee.—The production, distribution, and sale of coffee is controlled by the Stabilization Institute. About 30 per cent of the crop is segregated for export and minimum prices are fixed for the domestic market. In 1944, 76,850,000 pounds were produced.

Henequen.—Production of henequen fiber amounted to about 29,000,000 pounds. The value of the fiber crop was about \$2,600,000, and rope exports to the United States yielded approximately an equal sum.

Cattle Raising.—One of the chief industries in Cuba during early colonial times was cattle raising. With the expansion of the sugar industry, it diminished in importance, but after the collapse of the sugar boom it experienced a revival. From a beef importing country, Cuba again became an exporter. Camagüey Province, owing to its wide, rolling pasture land has always been the chief cattle-raising center. By 1945 the number of head of cattle had increased to nearly 6,000,000 due to favorable climatic conditions and the absence of pests. The government and the ranchers have taken active scientific measures to improve the breeds. Raw hides and skins constitute more than half of Cuba's pastoral exports. Horses, mules, pigs, and sheep are also raised. The dairying industry has grown steadily, producing cheeses, butter, and condensed milk.

Sugar Industry.—Despite its small size, Cuba is the world's greatest supplier of sugar, accounting for one fourth of the total entering international trade. India, the only country producing more, consumes almost its entire output. During favorable years the value of Cuba's sugar crop and its derivatives—molasses and syrups—averaged roughly around \$300,000,000 which represented over three fourths of the country's total exports. Of the cultivated land, 57 per cent is devoted to sugarcane, and during the four months of the harvest about 500,000 field workers are employed. It is more than evident that the sugar industry is the backbone of Cuba's national economy. This extraordinary development has been made possible by the remarkable fertility of the soil, which yields five or six crops without replanting; also the proximity of the United States market. As more than 80 per cent of the sugar crop normally has been sold to the United States, Cuba's prosperity, as long as it depends on sugar, will be contingent upon the demand in the United States. In 1947, as a result of the raising of the United States quota following the war's end, Cuba's sugar production reached an all-time high

of 6,448,328 tons, but prices were considerably below those obtaining during the great boom after World War I.

Sugar was first cultivated in Cuba late in the 16th century, but it was not until the end of the 18th century, when sugar crystallization was developed, that the industry began to expand, additional labor being supplied by the slave trade. A number of landed Cuban families acquired considerable wealth and more Spaniards arrived to exploit this new source of riches. The sugar mills were rudimentary, but slave labor kept production costs low. It was a patriarchal system, resembling that of the pre-Civil War southern plantations of the United States. The long struggle for Cuban independence wrought great havoc. A scorched earth policy was adopted by the revolutionary forces and resulted in wholesale destruction of crops and mills. Following the Spanish American War and the establishment of the republic (1902), the United States granted Cuba preferential tariff treatment. Foreign capital began to pour in and sugar became a big business. World War I accelerated the process. After the war's end, the price of sugar soared to over 20 cents per pound. Great corporations were formed, most of them controlled by United States capital. Cubans sold their mills and land for fabulous sums. It was "the dance of the millions." When the bubble burst it developed that Cubans no longer owned their sugar industry. Meanwhile, the foreign sugar companies, accorded extraordinary privileges because they now controlled Cuban economy, were the new colonizers, but without the responsibilities of government. The tendency toward concentration and centralization of production rapidly increased. Mammoth mills were installed and managed with a maximum of efficiency. Production rose from 1,000,000 tons in 1895 to over 5,000,000 in 1925. The workers were often paid in scrip which they could use only in the company stores. Haitian and Jamaican laborers were imported for the sugar harvest to the detriment of Cuban workers. Nevertheless, beet sugar, protected by high tariffs, competed favorably with Cuban sugar in the world markets and Java, with lower production costs, refused to subscribe to international agreements regulating production. As most of Cuba's other sources of wealth had been woefully neglected as a result of the "dance of the millions," the world depression hit Cuba particularly hard. The price of sugar fell to a fraction of a cent per pound and production dropped to less than 2,000,000 tons in 1932. Cuba's economy, geared to the sugar industry, was at the mercy of the international market. The sugar companies fared badly, and a relatively few United States and Canadian banks came to control a large part of the sugar properties. The result for Cuba was political revolution and the birth of a new national conscience which demanded not solely political but also economic independence. After the overthrow of President Gerardo Machado in 1933, the revolutionary governments adopted vigorous measures. The law prohibiting payment to workers in scrip was enforced. Haitian and Jamaican laborers who had illegally remained were repatriated. An eight-hour labor law was passed. The Association of *colonos*, or sugarcane growers, as distinct from the sugar mill owners, was formed in 1934 to protect their interests. The *colonos* constituted that part of

the sugar industry which had remained firmly in Cuban hands. The big sugar companies had two sources of sugarcane. One was the cane they grew and harvested on their own land, called administration cane. The other was the cane obtained from nearby plantations whose Cuban owners, or *colonos*, contracted with the mills to furnish them a quantity of cane in return for a corresponding amount of sugar ground by the mill. The smaller plantations (*colonias*) were particularly at the mercy of the mills. The Law of Sugar Coordination of 1937 fixed the proportion of sugar which the *colono* must receive for his cane and otherwise protected him. This was all the more effective as the new labor laws and minimum wages had forced the sugar companies to give up much of their administration cane and fall back on the *colonos* for their supplies of the raw product.

In 1930 the Cuban government created a Sugar Stabilization Institute, authorized to fix production quotas, control exports, and participate in international agreements. The Cubans who still retained a share in the sugar industry began playing a more active part through the Cuban National Association of Sugar Mill Owners.

But the sugar industry was no longer free. It had become, in fact, one of the most highly controlled industries in the world. This had been the outcome of the establishment of quota systems by consuming countries, principally the United States. Under the Jones-Costigan Act of 1934 the United States fixed sugar imports from Cuba at roughly 30 per cent of internal consumption. Although the tariff rate was lowered, a processing tax of one-half cent per pound was imposed on all Cuban sugar entering the United States, earmarked for the maintenance of the United States beet sugar industry. This measure, in effect, forced the Cuban sugar industry to subsidize the further development of United States beet sugar, its greatest competitor.

As a result of this system, Cuban sugar production must be fixed each year in accordance with the quota established by the United States. This is done by an annual decree of the Cuban president which also establishes individual quotas for each mill. In view of these restrictions on production, the big corporations and the banks began selling part of their properties back to the Cubans. In 1939, of 156 active sugar mills, 55 were owned by Cubans; 59, by United States interests; 28, by Spanish firms; and the balance, by Canadians and others. However, the United States mills, with greater capacities, controlled 55 per cent of the total production, while the Cubans controlled only 34 per cent. The trend toward a return to Cuban ownership continued during the following years. In 1946, Cubans owned 102 mills; the United States, 49; Spaniards and Canadians, 5 each; and all other foreign owners had disappeared. The United States mills then had only a slight edge on the production total.

During World War II great emphasis was placed on the derivative products obtained in the processing of sugar. Black strap molasses, in particular, found a profitable market in the United States as a source of industrial alcohol for war production. Many sugar mills also went into the distillery and liquor business as sidelines.

The two greatest enemies facing the sugar industry in the future are world overproduction

or, according to some, underconsumption, and the possible development of synthetic sugar substitutes. In preparation for such eventualities research work is being carried on to determine what other byproducts may be obtained from sugarcane which could find a world market. There seem to be possibilities in the field of plastics.

Manufacturing Industries.—Spanish policy prevented the growth of manufacturing industry in colonial times. After independence, and especially following the collapse of the sugar market in the late 1920's, the Cuban government inaugurated a policy of tariff protection which resulted in new manufacturing activities. This policy was continued and in 1945 the government issued several decrees providing for the duty-free entry of machinery and other industrial equipment, and granting broad tax exemptions to new industries.

In general, aside from sugar and tobacco products, manufacturing industries produce for internal consumption only. Industries using domestic raw materials include: the manufacture of cigars and cigarettes, rope and twine, jerked beef, dairy products, canned fruit, rum, furniture, cement, brick, and tile. Manufactures based on imported raw materials include: soap, perfumes, toilet preparations, beer, paint, wax matches, clothing, shoes, hats, paper, cardboard, ink, tin containers, glassware, and aluminum ware. Of the cotton textile used, 40 per cent is locally produced. The total number of workers employed in all manufacturing and mechanical industries in 1943 was 187,645.

Labor Relations.—Labor relations in Cuba are governed by constitutional precepts and advanced labor laws. Cuban labor is highly organized. Approximately 33 per cent of Cuban workers were unionized in 1946, the highest total of any Latin American country. The different unions together form the Confederación de Trabajadores de Cuba, or CTC (Confederation of Cuban Workers), which wields great influence in directing the labor movement. The Ministry of Labor is empowered to regulate and supervise the application of the labor laws, and acts as a conciliatory body in conflicts between management and labor. It also helps establish the basis for minimum wages. In 1945, the CTC announced itself in favor of the mechanization of the sugar and tobacco industries, which it had long opposed.

Trade.—Foreign Commerce.—Cuba has the third largest per capita foreign trade in the Western Hemisphere, following Canada and Argentina, and since 1904 has always had a favorable trade balance. In the last normal year before the outbreak of World War II, the country ranked fifth in foreign trade among Latin American countries: exports represented 8 per cent of the total value of exports of the 20 Latin American nations, and imports constituted 7 per cent of total Latin American imports.

DISTRIBUTION OF CUBAN FOREIGN TRADE IN PERCENTAGES

	Exports		Imports	
	1938	1945	1938	1945
United States.....	76.0	78.8	70.9	74.4
Europe and Asia.....	22.1	15.8	25.9	13.1
Latin America.....	1.9	5.4	3.2	12.5

The United States plays the leading role in Cuba's trade relations. It furnishes and absorbs between 70 and 80 per cent of all imports and

CUBA



above. The national Capitol (left) and the National Theater (right) in Havana. In the foreground is the monument to José Martí, leader of the movement for Cuban independence and one of the great prose writers of Hispanic America.

right. View of church from the plaza at Guantánamo, a typical small Cuban town on the Central highway.



left. This palm-fringed peasant home on the road to Viñales in western Cuba is characteristic throughout the countryside.

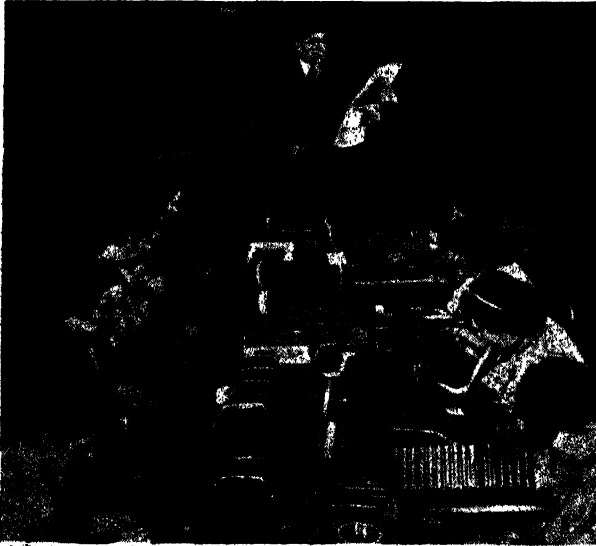
left. A group of men from a small settlement, taken by Herbert Lanks from Black Star



CUBA



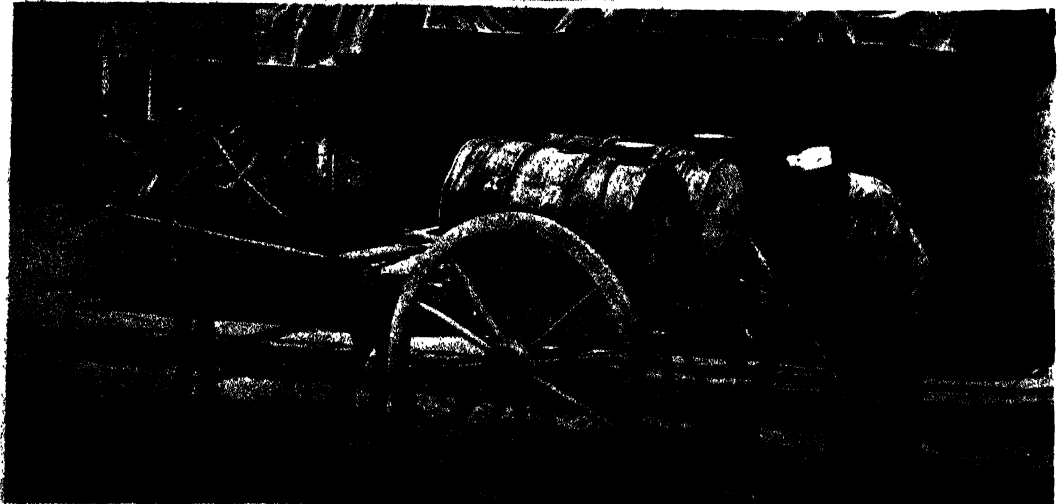
Above: Remains of a Spanish American War fort at El Caney in eastern Cuba which fell to United States troops after hard fighting, in 1898. From the top of the fort there is a good view of Santiago de Cuba and the surrounding country.



Left: Workers are entertained by a hired reader while they fashion cigars in a Cuban cigar factory.

Below: A peddler brings water to one of his customers in Guanabacoa, a Spanish colonial town three miles east of Havana.

Photos (top) by Herbert Lanks from Black Star; (others) © Gendreau



exports. Previous to World War II, the United Kingdom, other European countries, and some Asiatic countries supplied and purchased most of the other 20 to 30 per cent. But when the majority of these markets were closed to Cuba as a consequence of the war, the result was an increased percentage of trade with Latin America. All indications are that this trade trend, although a war-stimulated condition, will continue during peacetime.

CUBAN FOREIGN TRADE
(in thousands of U. S. dollars)

Year	Total exports	Total imports	Year	Total exports	Total imports
1925....	353,984	297,324	1936....	154,847	103,215
1926....	301,708	260,826	1937....	186,071	129,572
1927....	324,368	257,384	1938....	142,678	106,007
1928....	278,070	212,817	1939....	147,676	105,862
1929....	272,440	216,215	1940....	127,288	103,860
1930....	167,410	162,452	1941....	211,288	133,890
1931....	118,865	80,111	1942....	182,400	146,738
1932....	80,672	51,024	1943....	350,622	177,324
1933....	84,391	42,360	1944....	427,058	208,648
1934....	107,746	73,418	1945....	409,925	238,936
1935....	128,022	95,465			

Sugar is Cuba's outstanding export, and with its derivatives constitutes approximately 75 per cent of all exports. However, the percentage has at times been larger. Over the period between 1919 and 1930, sugar and its derivatives averaged 86 per cent of exports; tobacco and its products averaged 10.3 per cent; other products, such as minerals, livestock, and lumber, 3.7 per cent. In the period 1931-1941, sugar and its derivatives declined to 77.7 per cent; tobacco and its products remained approximately the same with 10.8 per cent; while other products, which included a higher proportion of food and minerals, rose to 11.5 per cent. This seems to indicate that the country has made some progress in its efforts to work away from a one-crop economy.

In the last prewar year, 1938, foods and beverages made up almost 30 per cent of all imports. The following groups constituted approximately 10 per cent each: machines, instruments, and vehicles; pharmaceuticals and chemicals; cotton and its manufactured products; minerals, glass, and ceramics; and metals and its manufactures. In 1945 the total value of imports more than doubled, owing in great part to higher prices, but the proportion of the different imports remained approximately the same.

Internal Trade.—Internal trade plays a very important role in Cuba's economy following agriculture and the sugar industry. One third of total employed persons are occupied in some form of commercial activity. In 1945 indicators, such as merchandise sales, construction, and electric power consumption revealed a higher degree of activity than in the previous year and very much higher than in 1938, the last prewar year. Total deposits in banks and the per capita circulation of money increased 300 per cent during the World War II years, indicating a very definite material improvement in the general welfare of the people. This was due to the fact that the large increase in the country's income after the outbreak of World War II was more equally distributed than in other prosperous periods, such as that which followed World War I. Wholesale and retail sales, based on tax returns, totaled \$1,260,000,000 in 1945, compared with \$809,000,000 in 1941.

In 1945, for the first time since Pearl Harbor, the tourist trade revived somewhat, with 21,349 visitors, but was still far below the 1937 peak

of 178,496. The tourist trade is an important source of income to Cuba. In normal years these visitors leave an estimated \$12,338,000, an average of \$91.85 each.

Transportation and Communication.—**Highways.**—Between the two extreme points of the island, Santiago de Cuba and Pinar del Rio, runs the Central Highway which was built in 1929-1931 and extends 706 miles. Tributary roads connect it with the provincial capitals and other large cities. Aside from these, however, road surfaces are poor. In 1945, Cuba had 255 miles of improved highway and 2,140 miles of paved road, or one mile of road per 19 square miles of area. At the end of 1944 there were 23,750 passenger automobiles, 14,829 trucks, and 2,635 busses.

Railroads.—The railroad network in Cuba is relatively mature, with 4,880 miles of main line railway. The United Railways of Havana (British capital) operates 2,335 miles of this main line track, covering the western end of the island. The Consolidated Railways of Cuba (United States capital) controls 1,731 miles and services the eastern part of Cuba. There are other smaller lines and many private railways run by sugar companies. In 1944, railroads carried an estimated 10,000,000 passengers. The street railway systems in Havana and the major cities carried 150,000,000 passengers in 1944.

Shipping.—The only Cuban ship lines are the Isle of Pines Steamship Company and the Empresa Naviera which respectively maintain sailings from the mainland to the Isle of Pines, and between main island ports. Before World War II many foreign lines maintained regular and irregular sailings connecting Cuba with the rest of America and Europe. In normal years about 5,000 ships entered Cuban ports. Havana handles approximately 83 per cent of imports and 27 per cent of exports. Exports pass through many other ports because sugar, the principal commodity, is shipped by the mills from the nearest port. There is a free trade zone in Matanzas, but it has not been properly developed and so had not proved of much value.

Airlines.—The Cuban National Aviation Company, a subsidiary of Pan American Airways, operates within Cuba only. A Cuban company, Expreso Aéreo Interamericano, runs a freight express between Havana and Miami, and between Havana and the Isle of Pines. Pan American Airways operates daily flights connecting the island with North and South America. In 1945, many privately owned and operated airports (mostly by sugar mills) were opened to the public, thus augmenting greatly the number of airports. Civil aviation has made considerable progress. A Civil Aviation Committee has been formed which acts as an advisory board to the National Transportation Commission.

Communications.—The Cuban postal service, under the Ministry of Communications, charges 2 cents per ounce for all local first-class mail; 5 cents per half ounce for local airmail; and 10 cents per half ounce for international airmail. Cables and radiograms are handled by Western Union, the West Indies Cable and Wireless, All America Cables, Mackay Radio, Radio Corporation of America, and Cuban Transatlantic Radio. Government-owned telegraph and radio telegraph systems service the entire island. In 1942 there were 357 telegraph offices with 8,805 miles of wire. The only public telephone system is oper-

ated by the Cuban Telephone Company, a subsidiary of International Telephone and Telegraph Corporation. In 1945 there were 73,995 telephones throughout the country, of which more than 90 per cent were connected with automatic stations, and there was a great demand for additional facilities. There are 110 long- and short-wave radio broadcasting stations. In 1945 there were 226,000 radios in private use.

Radio.—The 110 long- and short-wave radio broadcasting stations in Cuba are privately owned and free of state control. The chief ones are the RHC Cadena Azul, or Blue Network, with stations in six cities, and the CMQ Station. The Ministry of Communications has a government broadcasting station which puts on cultural and informational programs. Radio broadcasting has an important place in Cuban life. It is estimated that almost \$6,000,000 is involved in this new industry, and no other medium of communication or entertainment reaches so wide an audience.

Economic and Financial Factors.—*Public Finance and Public Debt.*—Due to the enactment of new tax laws and the increase of business activity, Cuba's national revenue more than doubled between 1939 and 1945, and a \$5,000,000 budget deficit was turned into a substantial surplus. The tax structure has become very complex and includes taxes on personal income, business profits, excess profits, sales, bank deposits, property transfers, land, transport, and stamp and excise taxes.

	Revenues	Expenditures
1939.....	\$71,000,000	\$76,000,000
1944.....	162,600,000	145,800,000
1945.....	177,100,000	154,300,000

In addition to the regular budgetary expenditures in 1945, \$16,818,371 was spent under extra budgetary appropriations, largely for public works and hurricane relief, which still left a surplus of almost \$6,000,000.

Cuba's funded debt in 1944 aggregated \$108,500,000 and was reduced to \$102,700,000 as of Dec. 31, 1945. The total debt under the \$25,000,000 Export-Import Bank of Washington credit was \$8,384,375 as compared with \$815,000 in 1944. The floating debt, consisting of unpaid claims for goods and services on open account and variously estimated as between \$50,000,000 and \$90,000,000, was not reduced, but neither was it increased during 1945.

Banking System.—Although legislation for the creation of a national central bank had been pending in the Cuban Congress since 1941, no action on it was taken before the end of 1946. In 1944 banking was in the hands of 7 United States and Canadian banks and 37 Cuban-owned banks. Of the Cuban banks, however, only a few, such as the Banco del Comercio, Gelats and Company, and the Banco de Nuñez, are important; the others conduct very limited operations. The United States and Canadian banks include the National City Bank of New York, the Chase National Bank, the first National Bank of Boston, the Royal Bank of Canada, the Bank of Nova Scotia, and the Canadian Bank of Commerce. In 1944, Havana bank clearings totaled \$1,280,630,000, while total bank assets and liabilities aggregated \$419,573,031, representing an increase of about 43 per cent over 1943.

Foreign Capital Investments.—By far the greatest share of foreign investments in Cuba is held by United States capital which was esti-

mated in 1940 at \$559,837,000, distributed as follows:

Sugar industry and agriculture.....	\$240,871,000
Utilities and transport.....	233,421,000
Manufacturing	26,845,000
Distribution	11,874,000
Petroleum	10,195,000
Mining	6,636,000
Others	29,995,000
	\$559,837,000

Investments of British capital at the close of 1943 aggregated £26,943,905 mostly in railroads. There were also considerable Spanish and Canadian investments, of which the former have been greatly reduced due to the transfer of property to Cuban ownership.

Monetary System, Coinage, Weights and Measures.—The monetary unit of Cuba is the peso, which has a par value of one U. S. dollar. Cuban silver pesos and silver certificates, as well as United States currency, constitute legal tender. The peso is divided into 100 centavos. Silver coins of 40, 20, and 10 centavos and nickel coins of 5, 2, and 1 centavos are minted. As there is no bank of issue, all certificates and coins are issued under government authority. Cuban paper money is in denominations of 1, 5, 10, 20, and 50 pesos, redeemable in silver minted coin. By 1943, silver certificates amounting to 132,051,212 pesos had been issued, backed by 79,790,000 silver pesos, \$44,999,907 in gold bars, \$1,240,712 in gold coins, and \$5,000,182.02 in United States currency. In 1945 the Cuban gold reserve was increased by purchases of bullion against dollars, which were withdrawn from circulation and replaced with Cuban currency, thus increasing the proportion of Cuban currency to dollars in the Cuban monetary system.

The metric system is the legal standard in weights and measures in Cuba. Other weights and measures commonly used are: the vara, 33.38 inches; the cordel, 0.1023 acres; the caballeria, 33.162 acres; the quintal, 101.43 pounds; the Spanish short ton, 2,028.6 pounds; and the Spanish long ton, 2,272 pounds.

Government.—The Cuban Republic is democratic, centralized, and based on a written constitution. The original Constitution of 1901 was amended in 1928 and voided in 1933 after the overthrow of President Gerardo Machado. On Oct. 10, 1940 a new constitution was promulgated. It provides for a division of powers between the executive, legislative, and judicial branches; guarantees individual liberties; establishes secret, universal suffrage; expressly rejects any discrimination on grounds of sex, race, or religion; and stresses social objectives, giving certain powers to the state to intervene in industry, commerce, and agriculture in the interests of the public welfare. The new constitution also introduced a modified form of parliamentary government by which the prime minister and the Council of Ministers appointed by the president are responsible to Congress and must resign after a vote of no confidence, but it limits the number of times Congress can exercise this power. The president, however, retains much the same wide powers as formerly, comparable to those exercised by the United States executive. He is elected for a four-year term but cannot succeed himself until eight years have elapsed. A vice president is also elected for the same term.

The Congress is divided into a House of Representatives, one representative for every 35,000 inhabitants, and a Senate composed of 54

members, 9 for each province. They are both elected for four years.

The judiciary is composed of a Supreme Court; a Superior Electoral Court; an *audiencia*, or superior court, for each of the six provinces; numerous courts of first instance and other minor municipal courts. The new constitution also provided for the establishment of a Superior Council of Social Defense, but it had not been established up to 1946. Pending its establishment, the penal system is administered by the Ministry of the Interior, in accordance with modern penal practices.

Foreign Relations.—The minister of state is in charge of foreign relations. Cuba was a member of the former League of Nations and joined the United Nations at its inception. She is also a member of the Pan American Union. Cuba's foreign service includes embassies in seven countries, legations in 16, and numerous consular offices in many nations. As in the United States, the Senate must ratify all treaties by a two-thirds vote.

Defense.—The president of Cuba is the commander in chief of the armed forces, which are administered by the Ministry of National Defense. Total army and navy personnel number approximately 20,000. The Regular Army consists of eight line regiments and a cavalry regiment with auxiliary services, and 43 Rural Guard units. During World War II compulsory military service was instituted, but after the war it was abolished. There is a small air force and a navy formed by several gunboats and a number of PT-boats for coastal patrol, as well as detachments of marines.

Public Welfare and Social Legislation.—Public welfare institutions are divided into those directly administered by the Division of Social Assistance of the Ministry of Health, and those which, though incorporated in the division, have an autonomous character. Chief of these is the National Corporation of Public Welfare which supervises all welfare institutions and provides them with funds from government or private sources. Profits derived from the National Lottery are allotted to the various welfare bodies. The Division of Social Assistance runs a eugenics service with eight local centers in different parts of the country and also has charge of the hospital for the insane and an asylum for the aged.

Cuba has a body of social legislation which ranks among the most advanced in the world. The Constitution of 1940 guarantees all workers an 8-hour day and a 44-hour week, with one month's vacation with pay for 11 months of work. Compulsory accident and maternity insurance, as well as other forms of social insurance, are established by law. The minimum wage law established minimum wages for urban and rural workers, which are steadily increasing, rising from \$1 a day for urban workers in 1938, to \$2 in 1944.

Public Health.—Government supervision of public health was greatly stimulated in Cuba after the Spanish American War, under the United States occupation, and has maintained a relatively high standard of efficiency. The Sanitation Department of the Ministry of Health has 126 local sanitation centers scattered throughout the country in the different municipalities in charge of enforcing sanitary measures. It also maintains an inspection service for drug control and milk pro-

duction and, besides the usual health department activities, it maintains a venereal prophylaxis service. Cuba is a member of the Pan American Sanitary Bureau and the World Health Organization of the United Nations.

Provincial and Local Government.—The Constitution of 1940 authorizes three types of municipal government. Up to 1947, however, the only one in operation was the traditional one of an elective mayor, or *alcalde*, and an elected municipal council. The other two types authorized, the city manager system and government by a commission, had not yet been tried.

According to the Constitution of 1940, no other political authority can depose a mayor or otherwise interfere with municipal government, which is granted privileges of taxation and can administer its own affairs, subject only to the authority of the courts. Municipalities provide public services and engage in public works within municipal limits. The municipality is the basic political unit of Cuba. The province represents merely a collection of municipalities within certain geographical boundaries. Although a governor of a province is elected by direct vote, the provincial council is formed by the mayors of the municipalities. The latter contribute corresponding quotas to the provincial budget for public works and other expenses beneficial to the province as a whole.

Way of Living.—Although the overwhelming majority of Cubans consider themselves Roman Catholics, and many, especially the women, are devoutly faithful, the church in Cuba has less social influence than in most Latin American countries and practically no political power. In this respect it can be said to wield less power than in New York and other large United States cities. Nevertheless, the church still represents a traditional social force, aside from its influence on the personal conduct of its followers. Church functions surrounding baptism, marriage, and death, as well as church attendance, are closely interwoven with social habits.

Despite ultraliberal divorce laws and foreign influence, the family is still, as in all Latin countries, the basic and most powerful social institution. Social pressure, the influence of the church, and economic factors all tend to preserve the family unit.

In general, family life is not restricted to parents and children but includes other relatives as well, endowing it with a distinctly clannish aspect. It is not uncommon to find three generations living under the same roof, including married children and in-laws.

Another characteristic which owes its origins to Latin civilization, based on the municipality rather than on the county, is the great importance given to the city or small town as against purely rural life. Despite the fact that Cuba is a predominantly agricultural country, the owners of farms or plantations, at most, spend only a short part of the year on them, preferring to live in the nearby town or the capital, according to their means. This may be owing to the fact that Cubans are a very sociable people. Not only do they constantly visit each other's houses on every possible occasion, but they like to meet continually in clubs, at parties, cafes, shops, and theaters. One out of every three residents in Havana belongs to a club or association of some kind. The smallest towns have their lyceum or casino, centers of social life. The old

custom of everyone congregating and walking around the plaza still lingers.

All sports enjoyed in the United States, except the winter sports, are widely practiced in Cuba. Baseball is highly popular, as well as soccer and basketball, with horse racing, jai alai, and cock-fighting having the added attraction of organized betting. The National Lottery also provides an outlet for the Cuban love of gambling.

Though women have the vote and there is a tendency toward further emancipation, the double standard is still the rule. It is a man's world and young girls, or married women for that matter, do not go out alone with men. This encourages sociability, for the two sexes can meet only in groups.

The upper class has three origins: the old landed Cuban families claiming noble Spanish descent; Cubans who have risen through politics or business since the establishment of the republic; and the more recent Spanish immigrants who acquired wealth in business and the sugar industry. It is this class that lives in the palatial homes in the suburbs of Havana, plays golf and dances in the country club or basks on the yacht club sands. The children are generally sent to expensive United States schools.

The rising middle class, in which the recent Spanish immigration is strong, runs the small businesses, while its older Cuban members run the politics and the government offices and fill the ranks of the liberal professions. The *colonos* or sugarcane growers, if not wealthy enough to belong to the upper group, must also be included. But Cubans are an easygoing people. Class distinctions are not rigid and there is no dividing line between these two classes. There is a steady movement between one and the other, as personal fortunes ebb and flow.

The line between the middle classes and the lowest is more sharply drawn. The latter is formed by the urban and rural proletariat, among whom the colored population predominates on the one hand, and the *guajiro* or peasant, more generally white, on the other.

The *guajiro*, as a distinct class seems fated to disappear, but he has been such a characteristic and essentially Cuban type in the past that he deserves special mention. The *guajiro* is the descendant of the early Spanish settlers who, because of their humble origin and lack of outstanding personal qualities, did not receive the extensive grants of land which formed the basis of the wealth of the prominent colonial families. They settled the small towns and villages of the interior where they acquired small properties or leaseholds from the big landowners. The less fortunate, in time, became tenant farmers or sharecroppers. Among the poorer there was intermixture with the Negro, particularly in Oriente Province, but the typical *guajiro* is white.

The *guajiro* soon developed distinctive folkways. The women wore calico skirts with a colored kerchief around their shoulders; the men wore straw hats with wide upturned brims—Panamas if they could afford them—and pleated linen *guayaberas* (a shirtlike garment hanging loosely over the trousers in lieu of a coat, particularly suited to the climate and now becoming popular even in the cities). The *guajiro* always carried a machete at his waist, a long, straight, wide-bladed weapon. Those who lived on the farms rather than in the villages were the poorer, sharecropper type. This accounts for the preva-

lence of the rickety, palm thatched *bohío*, or peasant shack, in the Cuban countryside and the rarity of well-built farmhouses. Though living in these flimsy and crudely constructed huts, the *guajiro* is still always hospitable to strangers, never failing to greet them with a small cup of coffee, one of his few luxuries.

His typical dish, the *ajiaco*, is a stew containing native vegetables such as yucca and yams, corn, bananas and, if available, beef. Other popular Cuban dishes are black beans and rice; rice with chopped meat, fried bananas and a fried egg; and yellow rice with chicken or pork. A roast barbecued pig is the traditional dish on Christmas. Much of the cooking is done by frying, and garlic and pimento are the condiments most used.

The *guajiro's* favorite pastime is cockfighting, a prize fighting cock being a highly valued possession. The undersized, but wiry Cuban horse is his chief means of locomotion. As in all countries of Spanish heritage, the *guajiro's* chief musical instrument is the guitar. His songs, the rather monotonous *punto* and the melancholy *guajira*, are also clearly of Spanish origin and form the basis of popular Cuban melodies. Equally of Spanish origin are his dances, chief of which was the *zapateado*, a kind of tap dance, now a lost art.

The *guajiros*, illiterate and subject to exploitation in colonial times, were the principal sufferers during the wars of independence. Those who have prospered since then, either through farming or politics, have joined the ranks of the new middle class. The rest, still with a high proportion of illiterates, are in the process of merging with the rural proletariat.

Almost one third of the proletariat, in both town and country, is unionized, thus receiving the benefits of advanced labor legislation and social insurance. The nonunionized, mostly Negroes and poor *guajiros*, have a very low standard of living, though efforts are being made to improve it.

The rural proletariat are mostly workers in the cane fields and sugar mills. Though their lot has been improved by labor legislation, they are plagued by the seasonal character of the sugar industry, which gives them not more than four months' employment out of the year. Whether black or of mixed blood, they have retained their African rhythms which, combined with the *guajiro* melodies, have given popular Cuban music its distinctive stamp. The rumba and the conga originated in the slave quarters of colonial plantations. The real rumba is quite different from the ballroom dance which has been introduced in foreign countries under that name and which in Cuba is called the *son*. In the real rumba, the couple dance separately, representing a primitive version of the battle of the sexes.

CULTURAL LIFE AND ACHIEVEMENT

Education.—Although the University of Havana was founded in 1728 and produced during colonial times a number of outstanding men, education was available only to the privileged few, and illiteracy was high. It was not until 1880 that elementary education was made compulsory, but owing to inadequate facilities, illiteracy decreased slowly. After the establishment of the republic (1902), free public education, nonsectarian in character, was administered by a government department, which in 1940 became known as the

Ministry of Education, and considerable progress was made. In 1943, 22.1 per cent of the population over 10 years of age was still illiterate. In that same year there were 7,516 classrooms, 9,515 teachers, and 371,443 pupils. There were also 140 night schools distributed in the six provinces, and 587 private schools with 71,077 pupils. Many of these private schools are conducted by the Catholic Church. The Ministry of Education also maintains 21 institutes throughout the country, which give secondary education and prepare for the university. It also runs 8 normal schools for teachers and various vocational and industrial schools.

The University of Havana, which is accorded autonomous privileges by the constitution, is divided into the faculties of philosophy and letters, sciences, engineering, architecture, education, sugar industry, law, social sciences and public law, commercial sciences, medicine, dentistry, and veterinary medicine. The student body elects annually the members of the *directorio*, or board of directors, of the Federation of University Students, which plays an important role in the control of university affairs, and frequently in the past has actively participated in the political life of the country.

Libraries.—There were 465 libraries throughout the country in 1943. The oldest one, containing 100,000 volumes, was founded in Havana in 1793 by the Royal Economic Society of Friends of the Country. The National Library was founded in 1901 and contains (1943) 207,423 volumes. The general library of Havana University contains 80,000 volumes.

Press.—Following earlier newspapers, the first important periodical was *El Papel Periódico* which appeared in Havana in 1790. There followed other publications which play an important part in the cultural and political life of the country. The oldest existing newspaper is *El Diario de la Marina*, which was founded in 1834, and which claims to be the oldest existing Spanish language newspaper in the world. Other leading papers having more than 20,000 circulation in 1946 were, *El País*, *El Crisol*, *Información*, *Prensa Libre*, *El Mundo*, *Alerta*, *Luz*, and *Siempre*. Among the weeklies, the two most outstanding are *Carteles* and *Bohemia*. Freedom of the press is guaranteed by the constitution.

Architecture.—The origins of Cuban architecture go back to the 17th century, but it was not until the 18th century that a distinctive style was developed, based on the architecture of southern Spain, influenced by Italian neoclassicism. Good examples of this period can be found in the old section of Havana in residential and government buildings, which were invariably constructed around a central patio featuring arched colonnades. Church architecture, on the other hand, did not attain the importance that it did in Mexico and Peru. In the 19th century a more florid influence was added to the prevailing classicism which gave Havana the appearance, so aptly characterized by Joseph Hergesheimer, of a "mid-Victorian Pompeii." After independence, numerous foreign influences, including North American, made themselves felt, and modern functional architecture was widely adopted.

Painting and Sculpture.—The National School of Fine Arts of San Alejandro was founded early in the 19th century by the French painter Jean-Baptiste Vermay. Aside from its regular courses, its school of applied arts has

special night classes to provide workers with the opportunity for study. There is also a vigorous group of young painters and sculptors who have discarded academic standards and follow the influences of modern masters.

Music.—The degree of serious musical interest in the country is evidenced by the existence of two full symphony orchestras in the capital, the Filarmónica and the Orquesta Sinfónica. Other important musical organizations are the Choral Society of Havana; Pro-Arte Musical, which brings outstanding world artists to Cuba; and numerous smaller societies. There is a municipal Conservatory of Music in Havana and a number of private ones. To meet the popular demand, both symphony orchestras give free concerts in the Municipal Stadium, and the Confederation of Cuban Workers, together with the Popular Concert Society, provide the workers and their families with the opportunity of listening to distinguished artists for a small annual fee.

Although in the past no outstanding musical genius has arisen, there have been many composers of lighter music, and a number of popular Cuban melodies have swept the world. The contribution of the Negro population, marked by its vital rhythmic quality, has been especially developed.

Under the influence of several Russian masters, a very active interest developed in ballet dancing, not unnatural in view of the love of dancing manifested in all sections of the population. An outstanding Cuban ballerina, Alicia Alonso, has won acclaim in the United States.

Literature.—That great age of enlightenment, the 18th century, did not fail to bear fruit in Cuban colonial society. The year 1790, which marks the arrival of the best of the Spanish governors, Luis de las Casas, may be taken as the beginning of a new era of intellectual and moral awakening. The Royal Economic Society of Friends of the Country was founded, which furthered not only the economic but also the cultural life of the colony. Three outstanding educators, José Agustín Caballero (1771-1835), Father Félix Varela (1788-1853), and José de la Luz Caballero (1799-1862), introduced modern currents of thought and succeeded each other at the San Carlos Seminary, at the University of Havana and at El Salvador School, founded by Luz Caballero in 1848. Meanwhile, the 19th century had ushered in two Cubans who laid the basis of a literary movement which helped to mold the growing national consciousness and paved the way for the independence struggle.

José Antonio Saco (1797-1879) was born in Bayamo, Oriente Province. In Havana he soon distinguished himself by his vigorous writings on political economy, history, and literature, and for a time held the chair of philosophy in San Carlos Seminary. But his temperament was too active for an academic existence. As a result of a controversy with the tyrannical Spanish governor, Miguel de Tacón (1777-1855), he was banished from Cuba. At various times, however, he represented the colony in the Spanish Cortes. In his writings he attacked the institution of slavery and became an early champion of the cause of independence. His most important work is an exhaustive six-volume *History of Slavery*.

Greater, from the viewpoint of the Spanish-speaking world, was the poet José María de Heredia y Campuzano (1803-1839). Son of a magistrate in the Spanish colonial service, he was

born in Santiago de Cuba. Early in life embracing the new-born ideal of liberty, he became involved in one of the first conspiracies for Cuban freedom. To escape capture, he fled to the United States, but he had already written *The Temple Pyramid of Cholula*, which has been called "the first romantic poem in the Spanish language." In New York he taught Spanish and published the first edition of his works in 1825, including *Hymn of the Exile* and *Al Niágara* (*Ode to Niagara*), two of his greatest poems, the latter written after a visit to Niagara Falls. Shortly after, he went to Mexico where he established himself, occupied high government posts, and after a brief visit to Cuba, died at the age of 36. His wide vision and the natural spontaneity and richness of his verse, expressive of the romantic sentiments of the age, mark him as one of the outstanding lyric poets of 19th century Hispanic literature, as well as the first great voice of Cuban freedom.

The romantic movement also produced a poetess, Gertrudis Gómez de Avellaneda y Arteaga (1814-1873). Born in Camagüey, her father was a Spanish naval captain and her mother of an old Camagüeyan family. She early revealed precocious literary talents, and at the age of 22 she left for Europe and settled in Spain, where she married and acquired her fame. Her most important work, *Baltasar*, a poetic drama based on a Biblical theme, had a great success in Madrid, and because of its breadth of scope and vigor led a Spanish critic to remark: "This woman is very much of a man!" But she did not forget her native Cuba and one of her finest lyric pieces was written on hearing the news of Heredia's death. After a last trip to Cuba, where she was greeted with great honors, she returned to Spain to end her days. There is no other woman writer of her stature in 19th century Spanish literature.

The poetic development in Cuba was carried on after Heredia by four poets: Gabriel de la Concepción Valdés (pseudonym Plácido, 1809-1844); José Jacinto Milanés y Fuentes (1814-1863); Joaquín L. Luaces (1826-1867); and Juan Clemente Zenea (1831-1870). Two of these, Valdés and Zenea, were executed by order of the Spanish governor because of their activities in favor of independence. Plácido was the abandoned natural child of a Spanish dancer and a mulatto hairdresser. The easy, sensuous music of his verse has made him the most popular of Cuba's poets. Zenea is outstanding as an elegiac poet, though he also wrote vehement, patriotic poems.

In the field of prose, Cirilo Villaverde (1812-1894) wrote a novel, *Cecilia Valdés*, which gives a colorful picture of Cuban life in the mid-19th century. Villaverde was very active in revolutionary conspiracies and died in exile in New York City.

With José Julián Martí (1853-1895), Cuba again produced a creative literary figure who opened new paths for the Spanish-speaking world and became the greatest of Cuban national leaders. Born in Havana of humble Spanish immigrants, José Martí was a forerunner of the *modernista* movement in Hispanic literature, as well as the organizer and moving spirit of the second war of independence which ended with the Spanish American War and the establishment of Cuban independence. The present Cuban republic owes its existence to Martí more than to

any other single man. He remains as one of the greatest men Latin America has produced. Imprisoned at the age of 16 for his espousal of independence during the first rebellion of 1868, he was exiled to Spain, where he studied for a time, later escaping to France, and thence to New York, Cuba, Mexico, and various countries of South and Central America. He engaged in literary work, but always with Cuban freedom uppermost in his mind. Returning to New York, he initiated and carried on a crusade for Cuban independence. In 1895, at the outbreak of the revolution which he had largely inspired, he insisted on accompanying Gen. Máximo Gómez to Cuba and was killed soon after in a skirmish with Spanish troops. Martí's oratorical powers were extraordinary. Like his prose and poetry, they were characterized by the trenchant, original turn of phrase and vivid imagery. In the course of his active career he produced numerous poetical works, very personal in style and couched in novel forms. During a brief lull in the midst of his revolutionary activities, he composed a collection of verses entitled *Simple Songs*, which introduced a fresh and wholly original note into Spanish poetry. Martí's prose works, filling many volumes, affected by his all-consuming devotion to Cuban freedom, do not form a systematic whole. Essays, political tracts, literary criticisms, newspaper articles, biographical sketches—all attest the universality of his vision, the wide range of his interests, and the never-failing spark of genius. Though his style was unorthodox, he was solidly grounded on the great Spanish classics, and he appreciated greatness in others wherever found. The first commentary on Walt Whitman and his poetry in a foreign language was written by Martí in an article published by the Argentine paper *La Nación*, in 1887.

After Martí, most of the modern and ultra-modern poetic movements have been felt and represented in Cuba. Julián del Casal (1863-1893), an aloof and sickly soul, was a fine craftsman, though limited in range. Some contemporary poets have turned to Afro-Cuban themes for inspiration.

The educator, Enrique José Varona (1849-1933), played a creditable part in the revolutionary struggle and became the leading intellectual figure in the young Cuban republic. He reorganized the educational system, served as vice president for one term, and then devoted himself to his writings and to the University of Havana, where he exerted a great influence on Cuban youth. A philosopher of the Spencerian school, he produced numerous works on psychology, sociology, and education, written in an admirably lucid and chiseled prose, which established his reputation throughout the Spanish-speaking world.

Science.—In the field of science Cuba has produced two world figures, Felipe Poey (1799-1891) and Carlos Juan Finlay (1833-1915 qq.v.). Felipe Poey, born in Havana, was a natural scientist famous for his contributions to ichthyology. After a short stay in Paris, where he published numerous scientific articles, he returned to Havana and became professor of zoology and comparative anatomy at the university. In 1863 he was also appointed professor of botany, mineralogy and geology, and later of philosophy. His 10-volume work on Cuban fishes, illustrated with over 1,000 of his own drawings, was his most outstanding work. In it he first made known to science hundreds of varieties of tropical fish. He

also published a geology and a natural history of Cuba. One of his pupils, Dr. Carlos de la Torre (1858—), carried on his work at Havana University.

Carlos Juan Finlay, born in Camaguey of Scottish and French parentage, studied medicine in Cuba and the United States. Dedicating himself to research in yellow fever, which was ravaging Cuba and many other parts of the world, he arrived at the conclusion that this disease was transmitted by a certain variety of mosquito and not by contagion, as was currently believed. He was met with general skepticism, however, and had no means of putting his ideas to a practical test. After the Spanish American War, a United States Army board attempted to eradicate the disease in Cuba but, ignoring Dr. Finlay's conclusions, met with no success. Finally deciding to try out his theory as a last resort, a series of heroic experiments, ably carried on under the supervision of Maj. Walter Reed, proved that Dr. Finlay was right, and one of humanity's scourges was thus conquered.

The Academy of Medical, Physical and Natural Sciences of Havana was founded in 1860 and reorganized in 1923. It has devoted itself in the past principally to the medical sciences. In 1942 a Cuban Society of Physical and Mathematical Sciences and a Society of Chemistry were founded to encourage and develop study and research in these fields.

Medicine and Public Health.—According to the reports of the local sanitation centers in 1943, the three most prevalent diseases in Cuba were malaria, typhoid fever, and tuberculosis. Aside from the Sanitation Department of the Ministry of Public Health, there are a number of institutions, government-sponsored but autonomous in character, to combat these and other diseases. Chief among these in the field of medical research are the Finlay Institute and the National Hygiene Institute. The National Tuberculosis Council seeks to isolate tuberculosis cases, takes care of them in various sanitariums and hospitals, and carries on an extensive educational campaign for prevention of the disease. There is a board of prophylaxis for leprosy, skin diseases and syphilis which also has charge of several hospitals and clinics.

A National Medical Association maintains high professional standards among practicing physicians, and the growth and wide acceptance of socialized medicine has been an interesting development. Beginning at the turn of the century among the Spanish immigrant societies for the benefit of their members, socialized medicine has been adopted by many Cuban institutions and has become thoroughly established. The socialized clinics offer medical care, hospitalization, and surgical operations without cost or at greatly reduced rates, as the case may warrant, for a monthly fee of \$2. See also *LATIN AMERICA*; separate biographies of important cultural figures.

HISTORY

Discovery and Colonization.—Cuba was discovered by Christopher Columbus on Oct. 28, 1492 during the first voyage to what he believed was the continent of Asia. It was not until 1511, however, that Diego Velásquez, appointed governor of the island, which derived its name from the native *Cubanacán*, established the first settlement at Baracoa, on the north shore of what is now the Province of Oriente. In 1514,

after harshly suppressing a rebellion of the native Indians under the leadership of a chieftain named Hatuey, Governor Velásquez brought horses and cattle, grain and other seeds, and agricultural implements, and proceeded inland to found the towns of Bayamo, Trinidad, Sancti Spiritus, and Santiago de Cuba, which became the first capital. In 1515, Puerto Principe (now Camaguey) and Havana (San Cristóbal de la Habana) were founded. The latter was first established on the south coast and was not moved to its present site until 1519. The Indians were by nature pacific; they rebelled only under great provocation, and when reduced to slavery, tended to pine away. Although judged by the standards of the times and in comparison with other conquistadores, Velásquez was relatively moderate in his treatment of the Indians, the race was rapidly being decimated. A Spanish friar, Bartolomé de Las Casas (1474-1566), rose to defend them, returning to Spain to plead their cause before the Council of the Indies. As a result, the outright enslavement of the Indians was prohibited, and the system of *encomiendas* (a kind of trusteeship which was supposed to educate them in the ways of civilization) was instituted. The colonists, however, generally disregarded the educational aspects of the system and continued enslaving the Indians in all but name. Negro slaves began to be introduced in 1523 in small numbers.

Velásquez proved to be a good administrator, but the colony suffered great losses in men and supplies because it had become the base from which the conquering ventures to the newly discovered Mexico set forth, and from which Hernando de Soto launched his ill-starred expedition to Florida and the Mississippi (1539). After Velásquez's death about 1524, there was a struggle for authority between the colonists who held municipal posts and the new governors, a conflict which was to remain in abeyance for three centuries. As the little gold to be had in Cuba had been quickly exhausted, and as there was no silver, the main attention of Spain was directed to other parts of the Americas where great riches were to be found, Cuba being largely abandoned to its own resources.

Age of the Buccaneers.—The capture and sack of Havana in 1555 by the Frenchman Jacques de Sores awakened the Council of the Indies to a new danger and brought back their attention to Cuba. Havana had become the enforced port of call for the fleets of treasure ships sailing to and from the Spanish Main, and its strategic position had shown it to be in truth "the Key to the New World." As a result, Havana was fortified and able military and naval men were sent as governors to defend it against the rapidly growing numbers of French, British, and Dutch buccaneers and corsairs who infested the surrounding sea lanes and repeatedly attacked Cuban towns. This state of affairs continued during the course of the 16th century. The Spanish settlers that had remained and their descendants, who may now be called Cubans, had turned from the search for gold to cattle raising and agriculture. They conducted a thriving legitimate trade supplying the Spanish ships with fresh provisions, and also a contraband trade with foreigners. The British, Dutch, and French (the latter mostly Huguenots), enemies of Spain were enemies also of the Catholic faith; and, though the Cubans were willing to trade with

them, they loyally supported their governor when it was a question of defending the island against foreign heretics. Owing to this state of continual hostilities, the growth of the colony was greatly retarded. Except for some 3,000 Spanish colonists who came from Jamaica when that island was ceded to the British (1655), immigration was greatly restricted. Though sugarcane had been introduced, it was cultivated only on a small scale. Copper also had begun to be mined in a small way.

Eighteenth Century: Period of Internal Development.—In 1697 the Treaty of Ryswick (q.v.) ended the War of the Grand Alliance which had involved Spain, England, Holland, and the Holy Roman Empire on one side and France on the other. This treaty had the indirect effect of ending once and for all the menace to Cuba of the privateers and buccaneers. A period of relative prosperity set in which coincided with the accession of the Bourbon dynasty in the mother country. The new Bourbon rulers reorganized the colonial administration and sent a succession of able governors to carry it out in accordance with the mercantilist theories of the age. Despite the monopolistic restrictions, Havana soon became one of the most thriving ports in the Western Hemisphere. New shipyards were developed and shipbuilding activities redoubled. A group of Havana citizens, headed by Col. Martín de Aróstegui, formed a trading company in 1740 after obtaining a royal charter which gave it a monopoly in the field. The government itself established a tobacco monopoly which in the future was to cause several open revolts of the tobacco growers (mostly *guajiros* belonging to the small farmer class) against its price fixing policy, until it was finally abolished. But if Cuba had been freed from the dangers of piracy, it now faced the consequences of regular warfare. After being threatened several times by British squadrons, toward the end of the Seven Years' War a full-scale expedition under the command of Lord Albemarle, and re-enforced with American colonial troops, attacked Havana in June 1762. After a siege lasting two months with heavy casualties on both sides, Morro Castle fell (August 14) despite the heroic resistance of the Spanish naval captain Luis de Velasco, and Havana surrendered. Havana citizens had aided in the defense and a Cuban from a nearby town, José Antonio Gómez, had organized a guerrilla force of *guajiros* which successfully harried the British forces and captured a number of prisoners. The British exacted a large indemnity from the city; but as they were anxious to develop its commercial possibilities and win over the inhabitants, the British occupation, which ended with the Treaty of Paris (1763), proved to be highly beneficial. Spain recovered possession of Havana in exchange for Florida. As the commercial advantages enjoyed under the British were now continued by Spain, Havana rapidly achieved great prosperity. Extensive fortifications were built which made it the most strongly fortified city in the Western Hemisphere. After the outbreak of the American Revolution, Spain followed her French ally in declaring war on England in 1779, and Havana became the base of operations. As a result, Mobile, Pensacola, and the Bahamas were captured from the British. It was from Havana that the French admiral, Count François de Grasse, sailed to aid in forcing the final surrender at Yorktown. Meanwhile,

by 1774, Havana's population had risen to 76,000, far surpassing that of New York. A series of able and enlightened governors carried out many public works, embellishing the city with parks and handsome buildings, including a theater. Two governors especially distinguished themselves: Marqués de la Torre (served 1771–1777) and Luis de las Casas (1790–1796). Las Casas, wisely counseled by the distinguished Havana citizen, Francisco de Arango, encouraged cultural as well as economic progress. Among the prominent landowning families, several of whom bore Spanish titles of nobility, a new civic spirit was born. In 1793 the Royal Economic Society of Friends of the Country was formed under Arango's leadership, bringing together the outstanding landowners and intellectuals of the colony, helping to mold a national outlook, and taking action for favorable reforms. The municipal government, in the hands of Havana citizens, likewise played an important role. The application of the new process for crystallizing sugar, and free slave trading, authorized in 1791, was to make possible the extraordinary development of the sugar industry, until then a minor enterprise. In the field of ideas, the American and French revolutions had not failed to exert an influence on the educated men of the colony.

Struggle for Independence.—The invasion of Spain by Napoleon, and the placing of his brother Joseph on the Spanish throne in 1808, started a trend of events which in 1810 originated the wars of independence in the South American colonies and in Mexico. There were many reasons why Cuba did not immediately follow their example. Not only was she cut off from the South American mainland, but she rapidly became a base for the concentration of Spanish forces sent to combat the rebels. Furthermore, the high prices prevailing during the Napoleonic wars, the almost complete commercial freedom enjoyed by Cubans, and the rapid expansion of the sugar industry had produced a period of prosperity which was not conducive to revolutionary activity. Moreover, the recent example of the slave revolt in Haiti made the white colonists fearful of the consequences of such action, particularly in view of the increase of the Negro population resulting from the importation of great numbers of slaves. There was also a large influx of Spaniards in Havana seeking refuge from the rebellious colonies, and they were naturally sworn enemies of independence. In 1817 a number of Spanish immigrants were granted plots of land and settled in the country. In 1818 free trade with foreigners was officially authorized. Nevertheless, the spirit of liberty was not to be denied. As early as 1822 a secret society formed along Masonic lines was organized, with the view of ultimate independence. Among the members was a young poet, José María de Heredia. Discovered by the authorities, Heredia escaped arrest by fleeing the country, but his poetical works, filled with the romantic ideal of freedom, inspired the new generation. The year 1823 saw the end of the short-lived constitutional regime in Spain which had allowed Cubans considerable liberties, aside from a certain degree of autonomy which they had always enjoyed. The triumph of absolutism was reflected in Cuba by the assumption of unlimited dictatorial powers by the governors general (1825). Freedom of the press was abolished, and in 1834 this new state of things was made permanent under the tyrannical Governor

Miguel de Tacón. These harsh measures only produced more numerous conspiracies. In March 1826, Francisco de Agüero, a youth belonging to a well-known Camagüeyan family, was executed because of his revolutionary activities, becoming the first of a long list of martyrs to the cause. Two Cuban delegates proceeded to Colombia to interview Simón Bolívar, the great leader of the South American wars of independence, who, having triumphed there, was planning to lead an expedition to free Cuba as well. The plan was never carried out owing to internal difficulties faced by Bolívar, and also due to the opposition of the United States, which feared that a Cuba freed from Spain might fall into the hands of England or France and thus become a dangerous threat. In 1837 and 1844 two more conspiracies were discovered by the colonial authorities, and the popular poet Gabriel Valdés (Plácido), along with many others implicated in the latter plot, was executed. The writer José Antonio Saco condemned the institution of slavery and, forced into exile by Governor Tacón, demanded independence. Meanwhile Narciso López, a Venezuelan by birth, had initiated revolutionary efforts. In May 1850 he led an expedition to Cuban shores, and failing then, he organized another revolt in August 1851 in which he was accompanied by a group of United States citizens. Not meeting with the expected support, López and most of the other members, after putting up a brave fight, were captured and shot. These expeditions had not had sufficient backing within Cuba itself to have a chance to succeed. The Spanish merchant class in Havana, whose interests were opposed to those of the Cuban landowners, were the worst enemies of independence and urged the governors on to harsher repressive measures. As a result, even the more moderate Cubans, who would have been satisfied with reforms granting Cuba fuller autonomy, began to favor outright independence, though some desired annexation to the United States. Secret conspiracies rapidly extended their ramifications throughout the island.

The Ten Years' War.—On Oct. 10, 1868, a landowner and lawyer of Oriente Province, Carlos Manuel de Céspedes, gathering a resolute band around him, freed his slaves and initiated the rebellion at the village of Yara. Revolutionary groups in neighboring Camagüey Province also took the field soon after, led by the titled landowner Salvador Cisneros y Betancourt (the Marqués de Santa Lucía) and the dashing Ignacio Agramonte. In the western provinces, too near the center of Spanish power in Havana, the insurrection did not achieve the same success, and many of its backers were forced to flee to the United States. Among them was Miguel Aldama, one of the wealthiest citizens of Havana, whose palatial residence is still one of the show places of the city. Aldama's properties were confiscated and he gave most of what remained to the cause. Another wealthy backer of the revolt was Francisco Vicente Aguilera, of Bayamo, Oriente. Owner of vast landholdings, he was later sent by the revolutionary government to represent it in New York, where he died penniless. Meanwhile, the leaders of the insurrection proclaimed the independence of Cuba, drew up a constitution modeled on that of the United States, and elected Carlos Manuel de Céspedes president (1869). Many *guajiros* and Negroes joined the rebel forces and the outstanding military leader was the Camagüeyan Ignacio Agramonte. After ini-

tial victories in several pitched battles, the revolutionary forces, undisciplined, lacking arms and supplies, and faced by superiorly equipped Spanish troops, endured untold hardships. Before he was killed in action in 1873, Agramonte successfully organized a cavalry force which, under Máximo Gómez y Báez who succeeded him, gave a good account of itself in many engagements. In 1874, Céspedes, who had been forced to retire from the leadership because of internal dissensions, was captured and shot. But shortly after, Gómez, with 1,300 infantry and 300 cavalry defeated a superior Spanish force at Las Guásimas, the Spaniards leaving more than 400 dead on the field. That was the last victory of the rebellion. Spain continued to pour re-enforcements into the island. The United States government, though sympathizing with the rebels, was unwilling to grant them belligerent rights. Finally the diplomatic Spanish Gen. Arsenio Martínez de Campos was able to conclude the Convention of El Zanjón, Feb. 10, 1878, promising reforms and a greater degree of autonomy. A precarious peace followed and the promised reforms were watered down, though in 1886 the institution of slavery was finally abolished. The Cubans in the eastern provinces had suffered heavily. Whole families had been wiped out and great damage had been inflicted on the sugar properties. Many Cubans emigrated to the United States and no other major revolutionary effort seemed possible.

Revolution of 1895.—An extraordinary man, José Julian Martí, now appeared on the scene. A brilliant orator, a writer and poet of great force and originality, with single-minded devotion to the cause of liberty, he rekindled the revolutionary spirit. In 1892 he founded the Cuban Revolutionary Party while living in exile in the United States. Rallying the military leaders of the previous insurrection, he raised funds, organized expeditions, and on Feb. 24, 1895, open rebellion broke out again at Bairé. Martí issued a manifesto to the Cuban people establishing the basis of the present Cuban republic, and insisted on accompanying the rebel General Gómez in his perilous landing on Cuban shores. Inspiring the patriot forces with his words and example, Martí was killed soon after, during an engagement with the enemy at Dos Ríos. On Sept. 13 1895, a revolutionary government was organized with Cisneros y Betancourt as president. General Gómez and his principal lieutenant, Antonio Maceo, who had defeated a Spanish force at Peralejo, almost capturing the Spanish general, Martínez de Campos, now determined to carry the war to the western provinces. A plan of invasion was drawn up and initiated at Baraguá, Oriente, in the month of October. Proceeding with great mobility, after fighting numerous engagements and defeating a Spanish column at Mal Tiempo, in Las Villas, the rebel forces entered Havana Province and reached the outskirts of the city in January 1896. Gómez then returned to a central position to maintain hostilities there, while Maceo with part of the forces, went on to Pinar del Río Province and reached the westernmost town of Mantua shortly after in a brilliant guerrilla campaign. In spite of their great superiority in men and equipment, all Spanish efforts to trap Gómez and Maceo proved futile. Determined to stamp out the rebellion at all costs, the Spanish government sent over 100,000 troops to the island and appointed Gen. Valeriano Weyler Nicolau to carry out a ruth-

less policy. Great numbers of the rural population were herded into concentration camps; stern reprisals were adopted against all suspected of rebel sympathies, and there was great destruction of property on both sides. Maceo was killed in an action in Havana Province in December 1896, but Gómez in the center and Calixto García in Oriente managed to keep up the resistance in spite of the overwhelming odds against them. Meanwhile, public opinion in the United States, naturally favoring the rebels, and fanned by the Cuban revolutionary junta in New York, had been aroused by the harsh Spanish policy.

Spanish American War.—As a result of United States protests, a new Spanish government attempted to inaugurate a conciliatory policy. General Weyler was recalled to Spain, and Gen. Ramón Blanco was sent as governor general with instructions to offer the autonomous regime which had previously been asked by moderate Cubans. But it was too late. The offer was rejected by the rebel leaders, who would accept nothing less than full independence, and was violently opposed by the Spanish merchants, who would not tolerate the slightest concessions to the Cubans. In view of the disorders promoted by them in Havana, United States Consul Fitzhugh Lee requested a naval force to protect American lives and property. The United States battleship *Maine* (q.v.) was sent in January 1898, and feeling against Spain was heightened in the United States by the publication in the press of a private letter written by the Spanish minister in Washington, which contained uncomplimentary references to President William McKinley. On the night of February 15 the *Maine* blew up in Havana harbor, with the loss of 260 members of the crew. Public opinion naturally blamed the event on the Spaniards. President McKinley on March 27 sent a virtual ultimatum to Spain demanding the cessation of the concentration camp policy, and the conclusion of an immediate armistice with the insurgents. The Spanish government agreed to the first but delayed acceptance of the second, offering Cubans an autonomous status similar to Canada's. On April 11, President McKinley sent a message to Congress proposing armed intervention to end the conflict. On the 19th, Congress passed a joint resolution empowering the president to employ the armed forces to that end, at the same time asserting that "Cuba is, and of right ought to be, free and independent," and demanding that the government be turned over to the Cuban people. On April 20, President McKinley signed the resolution and two days later he ordered the blockade of Cuba, thus initiating hostilities.

The Spanish American War was soon ended. (See UNITED STATES—*The War With Spain*.) A Spanish fleet under Admiral Pascual Cervera was destroyed off Sanitago de Cuba July 3, and the city of Santiago surrendered to a joint American-Cuban land force on July 17. On August 12, the armistice was signed, providing among other things for immediate evacuation of Cuba by Spanish forces. The last of the Spanish troops were withdrawn from the island Jan. 1, 1899. Meanwhile, in the peace treaty signed in Paris Dec. 10, 1898, Spain relinquished all claims to Cuba. The Spanish negotiators urged American annexation of the island to protect Spaniards residing there, but this proposal was rejected, and the treaty provided merely for temporary occupation by United States forces. This was considered neces-

sary to effect an orderly transition to independence and to meet the emergency presented by widespread starvation and disease.

Military Occupation.—The American military occupation of Cuba lasted from the end of the war until May 20, 1902. During this period the island's affairs were administered by a United States military governor, the office being filled by Maj. Gen. John R. Brooke (Dec. 28, 1898–Dec. 20, 1899) and by Maj. Gen. Leonard Wood (Dec. 20, 1899–May 20, 1902). With the aid of a few Americans and of Cubans, who filled the great majority of public offices, General Wood performed outstanding service in preparing the island for independence.

He reorganized the old corrupt and inefficient colonial administration and reformed the courts, though wisely preserving the Spanish legal system, as well as other existing institutions which represented a sound traditional force. He initiated a modern highway system, introduced efficient sanitation, reorganized and greatly extended educational facilities, and rehabilitated the island's primary economic enterprises. Under his administration the scourge of yellow fever was eliminated. Meanwhile, elections were held for delegates to a constitutional convention which met in Havana, November 1900 under the presidency of the venerable Cisneros. It drew up a constitution (adopted Feb. 21, 1901) largely modeled on that of the United States. When the Platt amendment was adopted by the United States Congress (March 2, 1901), giving the United States the right to intervene in Cuba for the preservation of its independence under certain conditions, the convention at first refused to incorporate it into the Cuban Constitution. It finally did so reluctantly on June 12 after a commission sent to Washington was assured it did not impair Cuba's sovereignty and that further economic assistance depended on its adoption. By it the United States also acquired rights to establish naval bases at Guantánamo and Bahía Honda. General elections were then held in December 1901 and in February 1902; Tomás Estrada Palma was elected first president of the country. The first Cuban Congress convened early in May. On May 20, 1902, which has become Cuba's Independence Day, General Wood formally surrendered his executive powers to President Estrada Palma, and United States military occupation was officially ended.

The Cuban Republic.—President Estrada Palma was a good, honest administrator, but he lacked the personal qualities that distinguish a political leader. Not trusting his popularity, when his first term expired, he allowed his Cabinet members to use any means to ensure his re-election. This brought on the armed revolt of the opposing Liberal Party which led to United States intervention, and a provisional United States government (1906–1909) under Charles E. Magoon. In the elections held on Nov. 14, 1908, under the supervision of the Magoon administration, José Miguel Gómez, the Liberal Party candidate, triumphed, assuming office in January 1909. From that time, until and including the election of Gerardo Machado y Morales in 1924, the Liberal Party was the majority party. Gen. Mario García Menocal, the Conservative Party leader, won the election in 1912 owing to a split in the Liberal Party when Dr. Alfredo Zayas formed the Popular Party. The ideological differences between the Conserva-

tive and the Liberal parties were even less than those between the Republican and Democratic parties in the United States. They both adopted a laissez faire economic policy, and Cuban history during that period was largely taken up by the rise and fall of sugar prices, and the domination of the sugar industry by foreign interests (see section on *Sugar Industry*). Politics was almost entirely in the hands of professional politicians. It is not surprising that political malpractices developed where there had been no free political institutions before; where a large proportion of illiteracy still prevailed; and where four centuries of autocratic colonial rule had conditioned Cubans to regard the government as an institution divorced from their private lives, subject to arbitrary control and inevitably corrupt. President Menocal's re-election (1916) was accompanied by charges of fraud, provoking another Liberal Party revolt which was unsuccessful. Following the end of his second term, Dr. Alfredo Zayas was elected with General Menocal's backing (1920). This was during the great sugar boom which was known as the dance of the millions, accompanied by wide demoralization. Gen. Gerardo Machado y Morales, the Liberal Party candidate, won the following election by a large plurality (1924). President Machado during his first four-year term gave Cuba an efficient government. He introduced much-needed reforms in the administration, carried to completion numerous public works, such as the Central Highway, and initiated the protection of Cuban industry. But the collapse of the sugar boom revealed his dictatorial tendencies. Personal ambitions led him to change the constitution (1928) in order to prolong his term of office, as well as to employ terroristic methods to destroy all opposition, discrediting him among a growing group of the non-political public. University students and professors originated the opposition, and an unsuccessful open revolt was followed by an underground campaign of terrorism which claimed many victims on both sides, proving that Cubans were still ready to fight and give their lives for freedom. A secret society known as the ABC was formed to combat the government, its leaders drawn from the young professional class, and the acute economic depression widened the general opposition. President Machado responded with harsher repressive measures and finally, in 1933, the newly arrived United States Ambassador Sumner Welles attempted to mediate between the government and the opposition. A well organized general strike followed by withdrawal of the army's support, resulted in the violent overthrow of General Machado (Aug. 12, 1933), who escaped by plane. A provisional government with Carlos Manuel de Céspedes, son of the former patriot, at the head, was formed with Ambassador Welles' blessing, but less than a month later (September 4) an army mutiny, led by the then Sergeant Fulgencio Batista y Zaldívar, and supported by the university students and a group of intellectuals and professionals, overthrew Céspedes and placed a revolutionary council of five in his stead. Soon after, Dr. Ramón Grau San Martín was appointed president and Sergeant Batista rose to be colonel and commander in chief of the army. Led by Dr. Grau San Martín, a new party, the *Revolucionario Cubano*, was formed, demanding "Cuba for the Cubans" and attacking "Yankee Imperialism."

Although rejecting communism, it enforced an 8-hour law and other legislation favoring native-born workers. The United States refused to recognize the Grau San Martín government, and after weathering an attempted revolt, he lost the support of some of his party and of Colonel Batista, resigning in January 1934. Col. Carlos Mendieta, a veteran of the war of independence who had the support of the traditional parties was then installed in office. The United States abrogated the Platt Amendment and a new trade treaty was negotiated. There followed a seven-year reign of provisional governments and temporary presidents, with Colonel Batista, as head of the army, wielding the real power. Nevertheless, the new policy of economic nationalism was continued by means of legislation such as the Law of Sugar Coordination (see section on *Sugar Industry*), and a program of public works was carried out under army auspices. Accused at first of Fascist tendencies, Colonel Batista won over the newly established Communist Party, aiding it to organize politically, and thus obtained labor backing. Constitutional government was restored when a Constituent Assembly was freely elected in which all parties were represented (Nov. 15, 1939), and a new constitution was drawn up and promulgated on Oct. 10, 1940 (see section on *Government*). Colonel Batista organized the *Coalicón Socialista Democrática*, formed by the Liberal Party, a part of the Conservatives called *Demócratas*, the *Socialista Popular* (Communist) and various smaller parties, and ran for president. He was opposed by Dr. Grau San Martín, who in turn was backed by the new *Revolucionario Cubano* Party, the remainder of the Conservatives (*Republicanos*) and other small parties. Batista won (July 1940), and though the opposition claimed there had been frauds, the elections on the whole seemed fair to most impartial observers. Soon after assuming office, President Batista legalized the CTC (*Confederation of Cuban Workers*), which was largely controlled by the Communist Party, and had assumed the leadership of all Cuban unions. Government revenues were substantially raised to meet a budget deficit by new taxes, including, for the first time, an income tax, and in December 1941, Cuba declared war on the Axis powers. Compulsory military service was instituted, though Cuban forces were not sent overseas. The government cooperated in the war effort by providing facilities for air and naval bases needed by the United States, increasing production of war materials and aiding in the anti-submarine campaign. At the expiration of his term, Batista, respecting the constitutional provision against re-election, backed for president Dr. Carlos Saladrigas, a lawyer and former leader of the ABC secret society, who had been his prime minister. Opposing him was Dr. Grau San Martín. Saladrigas was supported by the same coalition of parties, which had elected Batista, but Dr. Grau San Martín, also with the same support, won by a substantial plurality. His surprising strength was accounted in part, in addition to his popular following, as a protest vote by the general public against existing high prices and to the desertion of many liberals from the coalition owing to dissatisfaction with the imposition of Dr. Saladrigas' candidature. In any case, both Batista and Saladrigas accepted the results of the election and refused to countenance an attempted use of force by one

of their supporters, Gen. Manuel Benitez. Once in office Dr. Grau San Martín reorganized the army to curtail its political influence. To obtain a Congressional majority for his policies he made a deal with the Communists. Despite record heights of government revenues and budgetary spending, his administration disappointed many supporters who felt that he had made a poor choice of Cabinet ministers and was lax in law enforcement. In the 1948 elections Sen. Carlos Prío Socarrás of the Auténtico Republican Alliance won the presidency; but his three competitors, of the Democratic-Liberal coalition, People's Party, and Communist Party, polled more votes. Though he showed energy in combating Communist intrigues, President Prío was unable to stem the tide of political violence. Former President Batista (now a major general) seized power by a coup d'état on March 10, 1952 and declared himself provisional president. In October 1953 he announced presidential elections for a year later. The opposition candidate at the Nov. 1, 1954 elections was former President Grau San Martín. Alleging that the elections were rigged by Batista, Dr. Grau withdrew from the race two days before the vote and asked his supporters to boycott the contest which was won by the incumbent. About 50 per cent of the eligible voters went to the polls.

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MARTÍN ARÓSTEGUI,
Former Publisher and Editor, "The Havana P.M."

CUBA, village, N. Y., in Allegany County; altitude 1,500 feet; 12 miles northeast of Olean; on the Erie and Pennsylvania railroads. Industrial activity centers chiefly upon the production of cheese, electrical specialties, and boxes; the surrounding region is one of dairy and poultry farms. North of the village is Cuba Lake, popular locally as a resort. Cuba Reservation, at the southwestern tip of the lake, includes what is reputed to be the first petroleum spring discovered in America (1627). Pop. (1940) 1,699; (1950) 1,783.

CUBE, in geometry, a solid contained by six equal square sides. The content of a cube is found by multiplying the superficial area of one of the sides by the height; or, in other words, by multiplying the number that expresses the length of one of the edges by itself, and the product thus found by that number again, and this is called the cube of the number. A cube is generated by the motion of a square plane along a line equal to one of its sides, and at right angles to it; whence it follows that the planes of all sections parallel to the base are squares equal to the base, and consequently to one another.

CUBE, or **CUBIC NUMBER**, in arithmetic, the result of taking any number thrice as a factor; thus 64 is a cube number, and arises by multiplying 4 by 4 and the result again by 4.

CUBEB, ku'béb, the fruit of *Piper cubeba*, a climbing perennial with smooth stem and alternate lance-shaped, bright green, shining leaves. It is a native of the East Indies, being extensively cultivated in Java and Sumatra. It was introduced into medicine by the Hindus and Arabians, who employed it widely as a condiment also. Cubebs contain about 14 per cent of volatile oil, a small amount of an indifferent substance termed cubebin, and cubebic acid. They also contain a small amount of resin. A mixture of oils, resins and acids composes the oleoresin of cubebs that is used in medicine. It is an active spice somewhat related to pepper, its botanical ally, but the taste is more pleasant and less pungent. It is used as a local stimulant in indigestion and as a flavoring vehicle in mixtures and gargles. It is valuable, particularly in diseases of the mucous membrane, especially of the bronchi, of the bladder and of the urethra. Cubebs are very frequently smoked in cigarettes, in which form they have a pleasant stimulating effect on the mucous membrane of the bronchi and larynx.

CUBIC EQUATIONS, equations in which the highest exponent of a given quantity in any term is 3. Every such equation of one unknown quantity can be reduced to the form $x^3 + px + q = 0$, where x is the variable and p and q are constants. Every equation of this form has three roots, all of which may be real, or one may be real and two imaginary. The solution of cubic equations was accomplished first by Tartazlin and Cardan. An equation containing any number of variables in which the greatest sum of the exponents of the variables in any term is 3 is called a cubic equation. Thus $x^2y + 5y^3 + 6 = 0$ and $xyz + x^2 = 0$ are cubic equations in x , y , and x , y , z , respectively.

CUBISM, the name given to a movement in painting which began in Paris about 1910 and spread throughout the world, influencing the painting and sculpture of the 20th century, as well as its architecture and decorative arts. The leaders were Pablo Picasso and Georges Braque, and other members of the group included Albert Gleizes, Juan Gris, Roger La Fresnaye, Henri Laurens, Fernand Leger, Jean Metzinger, and Marcel Duchamp. The more thoughtful members of this group held that painting should not be a literal or realistic representation of nature, but that an object should be presented in terms of intersecting, often transparent, cubes, cylinders, and other geometric forms or figures. Thus represented, the object might lose its identity, but this was unimportant because the beauty and meaning of a work rests in the work itself and not in the subject with which it begins. This was the first analytical phase of cubism. Later, however, the principle of simultaneity developed—that is, an object was presented from different points of view in the same picture—and cubism entered its synthetic phase. Collages were used—pieces of paper or other material which were pasted on the canvas to become an essential part of the painting. As form and color were held to be one and inseparable, color became duller. Movement and modeling in depth were eliminated.

and pictures tended toward two-dimensional design. In the hands of some of its followers the concepts of the movement became somewhat obscured and cubism merged with futurism (q.v.). See also FRANCE—*Art and Architecture* (The 20th Century).

CUBIT, kû'bīt, an ancient measure of length. Approximate only, it applied to the length from the elbow to the tip of the longest finger. The Hebrews had two cubits—the ordinary cubit, and a longer one used by Ezekiel in his measurements for the Temple (Genesis 6:16; Deuteronomy 3:11; II Chronicles 3:3; 4:3; Ezekiel 43:13). Estimates vary between 16 inches and 25.2 inches. The Egyptian common cubit was about 17.72 inches; the royal cubit 20.67 inches.

CUBITT, Sir William, English civil engineer: b. Dilham, Norfolk, England, 1785; d. Clapham Common, Surrey, Oct. 13, 1861. He constructed the South-Eastern Railway (England) and the Berlin, Germany, waterworks, and was the engineer on many other important undertakings in England and on the Continent. His work in connection with the buildings erected in Hyde Park for the great exhibition of 1851 won him a knighthood.

CUCHIA, kōō'chī-ā, a teleost fish of the rivers and estuaries of India and Burma, growing to two feet in length. It is the sole representative of the family Amphipnoidae, and is remarkable for having on each side of the neck a respiratory air sac connected with the gill cavity. When in the water this amphibious fish constantly rises to the surface to breathe air, and is frequently found in the grass of the river bank.

CUCHULAINN or **CU CHULAIN**. See GAELIC LITERATURE; TAIN BO CUALNGE.

CUCKOO, kōōk'ōō, the English name of a well known European bird (*Cuculus canorus*), so named from the call of the male, copied in the "cuckoo" clock. About 14 inches in length, the cuckoo is plain gray on throat, breast, and back; the belly is white barred with grayish black. Young birds are rust colored above, barred heavily with brownish black, the underparts barred from head to tail. Celebrated since the time of Chaucer for its loud song, so noticeable in the English countryside in May, the cuckoo is an object of some mystery because of its parasitic nesting habits. The hen cuckoo invariably lays her eggs in the nests of small songbirds such as the meadow pipit and the hedge sparrow. Hence the word "cuckold" for a man whose wife goes to another's "nest."

The egg of the cuckoo is very small for the size of the bird, and sometimes resembles that of the host species in color. Eggs similar to those of the host in size and color are more apt to be accepted and hatched, and hence selection favors such eggs. It was once believed that the hen cuckoo lays her egg on the ground and then with her bill places it in the nest of her victim. It is now known that she lays her egg in the usual manner in the nest. Often, however, she does remove one of the eggs of the rightful owners of the nest with her beak. The young cuckoo, as soon as it hatches and before its eyes are open, with unfailing instinct works beneath the

other occupants of the nest, and then by rising up pitches them over the side of the nest to their death. Left in sole possession of the nest, it soon exceeds its small foster parents in size. Sometimes one sees a bulky young cuckoo fed by tiny warblers, which actually perch on the head of their gross "stepchild" to feed it.

Most of the numerous species of the family Cuculidae (q.v.) are called cuckoos of one kind or another. Many of the Old World species, but only one or two in the New World, share the parasitic nesting habits of the common cuckoo of Europe. Some of the parasitic species of Asia mimic small hawks. Presumably when such cuckoos approach the nest of a small bird to lay their egg, the rightful tenants are intimidated or frightened away.

The two common cuckoos of the United States, the yellow-billed (*Coccyzus americanus*)



Yellow-billed cuckoo

and the black-billed (*C. erythrophthalmus*), resemble the European cuckoo but are somewhat smaller and lack the barred underparts. Like most cuckoos they are slender, graceful birds, which slink rather furtively through thick vegetation and are more often heard than seen. They build a flimsy nest; sometimes the three or four bluish eggs are visible through its bottom. The voice of the American species is resonant and full bodied, but the syllables uttered do not resemble the word "cuckoo." Country people think they call most loudly before a summer storm and name them "rain crows." The road runner (q.v.) of the deserts of Mexico and southwestern United States is also a cuckoo. Called *paisano* by the Spanish speaking people, it is well known for the speed with which it dashes across the desert in pursuit of lizards and small snakes.

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C. VAURIE,
The American Museum of Natural History.

CUCKOO AND THE NIGHTINGALE, The poem by Sir Thomas Clanvowe, English 11th century poet. The poem was long attributed to Geoffrey Chaucer. It is an important link between 14th and 15th century English poetry because of the apparent careful study Clanvowe had made of the writings of Chaucer.

CUCKOO BEE, the name given to numerous solitary bees, especially of the family Nomadidae, which lay their eggs in the nests of other bees, make their homes there, and eat the food of their hosts, with whom they live harmlessly. The females do not sting severely.

CUCKOO FLY, a species of the hymenopterous family Chrysididae which, cuckoolike, live

at the expense of various solitary bees and wasps, but, unlike the cuckoo bee (q.v.), actually devour the young of their hosts. They may be seen on hot days briskly flying about and alighting on posts and trees, darting their ovipositors into holes in search of the cells or nests of other Hymenoptera, to lay their eggs in. After hatching as maggots they feed on the pollen stored up by the host. More often they are known to fasten on the back of the larva of their host, suck its blood and thus destroy it; they also appear to destroy the eggs of their host. Although the *Chrysis* lays from 6 to 10 eggs, all but one shrivel up. It has been noticed that the young larva seizes with its mouth parts a fold of the skin of the helpless larva of the wasp *Odynerus* and sucks it, without inflicting any visible wound. It spins its cocoon inside that of its host, remaining there until the following spring. Cleptidae, another species of the same family, are supposed to prey on sawflies, probably laying their eggs in the cocoons of the latter.

CUCKOO PINT, the common name for *Arum maculatum* of the family Araceae. It grows about a foot high and has arrow-shaped, polished leaves, black spotted, and a flower bract (spathe) resembling that of the calla, but edged with green and sometimes purple.

CUCKOO SPIT, a froth found on plants. It is a secretion of the larvae of small homopterous insects, of the family Cercopidae. It serves the purpose of concealing the larva from its enemies. See also FROGHOPPERS OR FROTH FLIES.

CUCKOOFLOWER or **LADY'S SMOCK** (*Cardamine pratensis*), a common meadow plant, family Cruciferae, whose white or rose-purple flowers, borne in a corymb, may be seen from April to July, growing in masses in swamps and wet meadows from Labrador to northern New Jersey, in Minnesota, and west to the Pacific coast of British America. It is also common in northern Europe and Eurasia.

CUCUJO, kōō-kōō'hō, or **CUCUYO**, kōō-kōō'yō, a luminous beetle of the click beetle family Elateridae, which, in the West Indies, Mexico, and northern South America, is often used as an ornament in the hair or upon the dress of women. The Indians capture them by waving about a stick to which they have attached a coal; the beetles are attracted by the light and may then easily be caught in nets. The Indians keep them in cages of wire netting, feed them each evening upon pieces of crushed sugarcane, and bathe them twice daily in tepid water. In this condition they are offered for sale in large numbers in the shops and street-markets of Veracruz and other tropical cities. The principal species (*Pyrophorus noctilucus*) is from one and three quarters to two inches in length, and has no beauty by daylight, being rusty brown or blackish; but when belted and attached to a pin in the hair by a delicate chain it glows at night like an immense gem.

CUCULIDAE, kū-kū'li-dē, the cuckoo family, the principal one of the order Cuculiformes. The toes are paired, the first and fourth being directed backward, the second and fourth forward. The family contains about 130 species, chiefly tropical, but a few extend far north in

the summer, and migrate to warmer regions in winter. Most cuckoos are slender, medium-sized birds, of furtive habits but with loud sonorous voices. The principal subgroups of the family are: (1) Couas—a group of species native to Madagascar; probably primitive, they may be related to the turacos (family Musophagidae). (2) Coucals—primitive-looking African and Oriental grass-dwelling forms of the genus *Centropus*. (3) Malcohas and squirrel-cuckoos; species of this group build a crude nest. Many of them have brightly colored bills. The American yellow- and black-billed cuckoos are placed here. (4) Anis—peculiar, black cuckoos of tropical America. They feed on the ground among grazing animals in groups, each of which builds a large community nest in which several females lay their eggs. (5) Ground cuckoos—specialized running forms, including the road runner (q.v.) of the American southwest. One or two species of American ground cuckoos (but not the road runner) are parasitic in nesting habits. (6) The Cuculidae or true cuckoos, an Old World group whose members lay their eggs in the nests of other birds, and hence have parasitic breeding habits. Some of the species are as large as crows and lay their eggs in the nests of the latter birds. See also CUCKOO.

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The American Museum of Natural History.

CUCULIFORMES, kū-kū-lī-fōr'mēz, an order of birds characterized especially by zygodactylous feet (that is, yoke-toed, with two toes directed forward, two backward). It contains two suborders: cuckoos (Cuculi) and turacos (Musophagi). The former are of worldwide distribution, the latter restricted to Africa.

CUCUMBER, kū'kūm-bēr, the fruit, or the plant on which it is borne, of *Cucumis sativus*, in the gourd family, Cucurbitaceae. Augustin de Candolle, the Swiss botanist, concluded that the cucumber is a native of Asia, probably India, and it is generally agreed that it originated in southern Asia. Cucumbers have apparently been grown in India for at least three thousand years, and were used by the ancient Greeks and Romans.

The cucumber plant is a climbing or spreading vine; the stem is stiff-hairy and angled, equipped with springlike tendrils; the leaf blades are about 6 inches long, shallowly 3- to 5-pointed. The flowers, an inch or more across, are of two types, staminate and pistillate. These are normally on the same plant. They have 5 narrow sepals and 5 deep-yellow petals, fused below. The staminate flowers are equipped with seemingly 3 but actually 5 fused stamens surrounding an abortive pistil. In the pistillate flowers the ovary, which will develop into the cucumber, is visible as a long narrow structure beneath the petals; this flower usually has 3 stigmas, a conspicuous nectary, and rudimentary stamens. Since the flowers are of two types, staminate and pistillate, pollination must be by some outside agency, and it is commonly effected by bees. The young "fruit" is prickly, the more mature one—the cucumber—commonly smoother. It is 3-parted internally, has a pulpy center and numerous ovules and seeds. Botanically this fruit is a berry in which the outer wall is hardened and modified—a pepo. In recent years forms with relatively smooth skins and mild flavor have been obtained by selective breeding.

Cucumbers do best in rich, well drained, fairly moist, warm soil, in localities with a growing period free from temperature extremes for 4 to 5 months. In North America the commercial crop comes especially from the sandy regions of the Atlantic and Gulf coastal plains. Animal manures, commercial fertilizers containing nitrogen, phosphoric acid and potash, and soil-improvement crops such as velvetbeans, are used to enrich the soil. Since growth of the seeds is in warm soil, effective field planting is after danger of frost is past. Sometimes, however, as many as 3 successive plantings are made, at intervals of a week or more, the first before the normal date of the last killing frost, to try to obtain a profitable early crop.

Near certain centers of population, including Boston, Chicago, Rochester, N. Y., and northern Ohio, cucumbers are grown in greenhouses. Since they require relatively long, sunny days, they are raised in spring, the same houses being used in winter for forcing lettuce, and in autumn for either lettuce or tomatoes. To secure the financial advantages of an early crop, cucumbers are started in greenhouses in certain areas, especially around Norfolk, Va.; after 4 or more weeks they are transplanted to coldframes, in which growth occurs under partially controlled temperature conditions. From seed sown toward the end of February a crop is thus harvested in June. Cucumbers must be gathered frequently—every second day or every day—before they are completely mature, and before the seeds begin to harden. The best grade consists of uniform, symmetrical, cylindrical fruits, those varying in shape and color, including the “nubbins,” being less valuable. “Fancy” cucumbers are sometimes coated with a special wax, to prevent evaporation and to keep them “fresh.”

“Pickles” are sometimes the oval, prickly, small-seeded fruits of the West India gherkin, *Cucumis anguria*; more commonly, however, they are young cucumbers. Vines which produce fresh cucumbers may also yield pickles, but different varieties, early bearing and with numerous small fruits, are usually utilized. Cucumbers 1 to 3½ inches long are most desirable for pickling; the less perfect ones furnish “chop pickles.”

Cucumbers are attacked by various insect enemies, especially the striped and the spotted cucumber beetles. They damage and often kill young plants, and also spread the bacterial wilt disease. These beetles are controlled by using insecticidal dusts; these and the other substances mentioned below are also more or less poisonous to human beings, and should only be employed with proper precautions. Among the insecticides used against cucumber beetles, normally applied in combination with a carrier, are nicotine dust, calcium arsenate, copper oxychloride, rotenone, and pyrethrum.

Diseases of cucumber include damping off, combatted by dusting the seeds with red copper oxide dust before planting; bacterial wilt, spread by cucumber beetles, controlled by applying calcium arsenate-copper oxychloride-talc dust, or by bordeaux mixture plus calcium arsenate; angular leaf spot, controlled by soaking the seeds briefly in dilute mercuric chloride solution, plus crop rotation; and cucumber mosaic, a virus disease, largely insect transmitted, partially overcome by inbreeding resistant strains, and by clean cultivation and insect control.

EDWIN B. MATZKE.

CUCUMBER TREE, the common name of several trees, especially *Magnolia acuminata*, family Magnoliaceae. Ranging from New York and Ontario to Georgia and Oklahoma, this tree, sometimes 100 feet tall, has thin, deciduous, oval leaves 6-10 inches long, greenish yellow flowers 2-3 inches high, and red, aggregate fruits 2½-3 inches long, faintly suggesting a cucumber. It is often planted, and the weak, light-colored wood is used commercially. *Magnolia macrophylla*, the large-leaved cucumber tree, with leaves 1-3 feet long, fragrant white flowers about 1 foot wide, and rose-colored fruits, extends naturally from North Carolina to Florida and Arkansas. It is cultivated in North America and Europe. The bilimbi, *Averrhoa bilimbi*, family Oxalidaceae, native of India or Malaya and widely grown in the tropics, is also known as cucumber tree. It has pinnate leaves of numerous leaflets, and edible but sour, oblong, greenish, cucumber-like fruits. The two species of the arborescent genus *Dendrosicyos* in the gourd family, Cucurbitaceae, both native of Socotra, are also called cucumber trees.

CUCURBITACEAE, kû-kûr-bî-tâ'sê-ê, the gourd family, embracing some 100 genera and about 800 species of doubtful evolutionary affinities, often placed near the passion flower and begonia families. They are mostly climbing or trailing vines, with coiled tendrils, palmate leaves and stiff hairs. The flowers, often yellow, are imperfect, with 5 sepals and petals; the staminate have 5 stamens, occasionally separate, usually variously fused. The pistillate flower has an inferior ovary, commonly 3 parietal placentae and numerous seeds. The fruit is usually pepo-fleshy, berry-like, the outer wall forming a leathery or hard rind. The family is mostly native to tropical regions, extending into the temperate zones; 15 genera are native to the United States, others introduced. Common representatives are: pumpkin, squash, gourd (*Cucurbita*); melon, muskmelon, gherkin, cucumber-pickle (*Cucumis*); watermelon and citron (*Citrullus*); bottle gourd (*Lagenaria*); snake gourd (*Trichosanthes*); vegetable sponge, dishcloth gourd (*Luffa*); squirting cucumber (*Echballium*); bur-cucumber (*Sicyos*); and wild balsam apple (*Echinocystis*).

EDWIN B. MATZKE.

CUCUTA, kôo'kôo-tâ, or **SAN JOSE DE CUCUTA**, city, Colombia, capital of the department of Norte de Santander, near the Venezuelan frontier. It is a place of recent origin which had begun to grow very rapidly when it was destroyed by an earthquake May 18, 1875. Rebuilt soon afterward, it is today the handsomest, and commercially the most active, town in the department. It is an important coffee center. A railway connects it with the Zulja River, which is navigable by small steamers. Pop. (1938) 37,323.

CUDAHY, kûd'â-hî, city, Wisconsin, Milwaukee County; altitude 714 feet; on Lake Michigan; 7 miles south of Milwaukee; on the Chicago and North Western Railroad. Industrial establishments include a meat-packing plant, vinegar distillery, tannery, and bottle-washing machinery plant. Pop. (1950) 12,182.

CUDDAPAH, kûd'â-pâ, district and town, India, in the presidency of Madras. The

district has an area of 5,923 square miles, and is transversed north to south by the Eastern Ghauts, and watered by the Pennar and its affluents. The heat is intense in April and May. Soda is found in the hills to the southwest, and is used by the natives in place of soap. Salt and saltpeter likewise abound and are easily procurable. On the plain around Cuddapah haematite and fusiform iron ores are found. On the banks of the Pennar, about seven miles northeast of the town of Cuddapah, are diamond mines, which have been worked for several hundred years, and in which gems of considerable value have been found. The mines have not recently proved profitable. Nearly a fifth of the district is under grain cultivation. Cotton is likewise grown. The town lies on a small river of the same name, an affluent of the Pennar, 140 miles northwest of Madras. It exports indigo and cotton, and manufactures a kind of coarse cloth. Cuddapah was formerly the capital of an independent state. Population (1941) of the city, 28,246; of the district, 1,056,507.

CUDWEED, one of the popular names of many small weeds of the genera *Gnaphalium*, *Antennaria*, and *Anaphalis*, of the Compositae. The leaves and stems are covered with a white cottony down, and the flowers are composed of dry scales, and may be kept for a long time. They are also known as everlasting flowers. The genus *Gnaphalium* has about 120 widely distributed species, and the cudweeds belong properly to this genus alone. *G. polycephalum*, common in old fields and open woods, blossoming in October and November, has some repute in household medicine.

CUDWORTH, Ralph, English clergyman and philosopher: b. Aller, Somersetshire, 1617; d. Cambridge, June 26, 1688. He was educated at Emmanuel College, Cambridge, and became an eminent tutor. He was subsequently appointed rector of North Cadbury, Somersetshire, and in 1642 published a *Discourse Concerning the True Notion of the Lord's Supper*, and *The Union of Christ and the Church*. The first of these productions, which maintained that the Lord's Supper is a feast upon a sacrifice, produced considerable controversy long after the author's death. In 1644 he was chosen master of Clare Hall, and in the following year was made regius professor of Hebrew. In 1654 he was chosen master of Christ's College, Cambridge, where he spent the remainder of his days. In 1678 he published his grand work, entitled *The True Intellectual System of the Universe, the First Part, Wherein All the Reason and Philosophy of Atheism is Confuted, and Its Impossibility Demonstrated*. It is a work of great power and erudition, although the attachment of the author to the Platonism of the Alexandrian school has led him to advance some opinions which border on incomprehensibility and mysticism. It champions the innate character of moral ideas which are held to cognize the objective reality of good and evil with the same accuracy which characterizes our geometrical knowledge. Selections appear in L. A. Selby-Bigge's *British Moralists* (Oxford 1897).

Consult Lowrey, C. E., *The Philosophy of Ralph Cudworth* (New York 1884); Seth, J., *English Philosophers and Schools of Philosophy* (London 1912).

CUENCA, kwāng'kă, city, Ecuador, capital of the Province of Azuay, and in size the third city of the republic, Quito being first and Guayaquil second. It is situated in the canton of Cuenca, 8,640 feet above the level of the sea, the mean annual temperature is one degree higher than that of the national capital, though it lies 189 miles farther toward the south. As a center of literary and artistic life, and the birthplace of celebrated authors, it is called "the Athens of Ecuador." Civil, military and ecclesiastical authorities are the governor, town council, bishop, commanding general of the district, superior court of justice, judge of commerce and chief of police. Principal institutions are the town hall, cathedral, seven churches, and several convents, orphan asylum, hospital, prison, library, parks, the university (with faculties of law, medicine, philosophy, mining, and science), lyceum for younger students, an athenaeum, and a school of fine arts, giving instruction in drawing, painting, architecture, music and the history of the arts. It is the center of a fertile grain, cotton, and sugar producing region, and gold deposits are worked in the neighborhood. The most important manufactures are pottery, Panama hats, leather, and woollens, and a considerable trade in preserved fruits, cheese and grain is carried on. Cuenca was founded in 1557, on the site of the old Inca town of Tomebamba, and in 1786 was created an episcopal see. The mountain of Tarqui on the south was chosen in 1742 for determining the meridian line of La Condamine, Bouguer and Godin. At the base of the mountain occurred the battle of Tarqui in 1828 between the Colombian and Peruvian forces. Chinchona bark is an important export. Pop. (1950) 46,428.

CUENCA, kwāng'kă, province, Spain; one of the divisions of New Castile. The north and east are mountainous; the south and west, a fertile plateau crossed by rivers, the chief of which is the Júcar, draining southwestward. Rock salt and gypsum are mined; timber and paper products are important. Cuenca also produces sheep and goats, wool, wheat, saffron, honey, and fruits. Area 6,636 square miles; pop. (1940) 333,335.

CUENCA (the ancient CONCA), commune. Spain; capital of Cuenca Province in New Castile. It is situated 89 miles east-southeast of Madrid on a high, craggy hill, 3,070 feet above sea level, between the rivers Júcar and Huécar. It is the seat of a bishop, and has a fine Gothic cathedral which was begun in the 13th century, a castle, and generally retains its medieval aspect.

Probably founded by the Moors, who in the 9th century had a fortress here called Conca, the town was captured in 1177 by Alfonso VIII of Castile and soon became a bishopric. During the Middle Ages, Cuenca was famous as a textile-making town and as a center of learning, but it declined in the 17th century. It was taken by the British in 1706, by the French in 1808 and 1810, and by the Carlists in 1874. During the Civil War of 1936-1939, it remained loyal to the republic until nearly the end of the struggle. Cuenca has a few small industries. Pop. (1940) 23,038.

CUERNAVACA, kwär-nä-vă'kă, city, Mex-

ico, capital of the State of Morelos and a place which has long been noted for its fine climate; 37 miles south of Mexico City. It is built on the southern foothills of the mountains which separate Morelos from the Federal District. Before its capture by Hernán Cortés in 1521, the place was the capital of the Tlahuicas, a tribe of the Aztec Confederacy. It was subsequently made part of the personal domain of Cortés, becoming a favorite residence of the conqueror and of later rulers of Mexico, including Maximilian and Carlota who did much to beautify it. The Palace of Cortés, which is used as a government building, was begun in 1530, but has been much changed in the course of time. It contains some fine murals by Diego Rivera. The city is noted for its beautiful gardens, and its elevation of 4,500 feet makes it an ideal winter residence for persons from Mexico City, with which it is connected by highway and railroad. Manufacturing is limited to tobacco factories, sugar refineries and distilleries. Pop. (1950) 30,597.

CUERO, kwá'rō, city, Texas; seat of De Witt County; 77 miles southeast of San Antonio. It is situated at an altitude of 177 feet on the Guadalupe River, and is served by the Southern Pacific Railroad. Located in an agricultural region which produces poultry, pecans, truck garden products, cotton, and livestock, the city has cotton gins, cottonseed oil mills, and is notable for its production of dressed turkeys. A Turkey Trot Celebration is held here each November. Hydroelectric power comes from a dam on the Guadalupe, and natural gas supplies a cheap fuel. Cuero was founded in 1872, incorporated in 1873, and has a government by mayor and council. Pop. (1940) 5,474; (1950) 7,498.

CUESTA, kwēs'tà, a low ridge with a steep slope on one side and a gentle slope on the other, controlled by the inclination of the rock beds, the gentle slope corresponding to the dip of the beds and being called the dip slope, the steeper descent being known as the scarp or escarpment slope. As the inclination of the beds grows steeper the dip and scarp slopes become more nearly alike, and the ridge is known as a hogback, a ridge produced by the upturned edge of a hard layer of rock.

CUEVA DE GAROZA, kwā-vā thā gā-rō'thā, Juan de la, Spanish poet: b. Seville about 1550; d. 1609(?). Little is known about his life. He spent several years in Mexico (1574-1577) where he was a sort of private secretary to his brother Claudio, one of the principal officers of the Inquisition. He also lived for some time in the Canary Islands. When in Spain he made his home in Seville, which had already become a great literary and dramatic center. But in 1606 he went to Cuenca. A poet attempting all forms, he excelled most as a dramatist, and is one of the founders of Spanish national drama, and one of the most influential of the predecessors of Lope de Vega. He was one of the most successful and popular dramatists of his day; but it is as an innovator that he is of most interest to the student of Spanish literature. He influenced Guillén de Castro y Belvis, who, in his turn, influenced the literature of France and England. Cueva intro-

duced the historical drama, making use of the old romances and turning them into dramas; and he forecast the drama of cape and sword.

Using a free hand, he attempted to reform the drama, and in a measure was successful. He employed new metrical forms and popular poetical styles, and freed the drama from the traditional unities of time and place. Cueva is also remembered for introducing the Don Juan type of character in his *El infamador* (*The Libertine*, 1581), a type exploited so successfully afterward by Castro and countless others. Cueva's theories are set forth in his *Ejemplar poético ó arte poética española* (1605).

In a volume of *Obras* (*Works*; 1582), he published a number of lyric poems, sonnets, songs, and elegies.

CUFFE, Paul, American Negro seaman and philanthropist: b. Cuttyhunk Island, in Buzzard's Bay, Mass., Jan. 17, 1759; d. Westport, Mass., Sept. 9, 1817. His father was an African-born Massachusetts slave, who purchased his freedom and brought up a family of 10 children; his mother was a Nantucket Indian. At 16 Cuffe was a sailor on a whaling vessel, and by 1806 was an experienced navigator, owning considerable landed property, houses, stores, a sizeable ship, two brigs, and several smaller craft. In 1797 he bought a farm on the Westport River in Massachusetts, built a schoolhouse, hired a teacher, and opened at his own expense the only public school in the neighborhood.

He was active in securing legal rights and privileges for Negroes in Massachusetts, and soon became an advocate of the resettlement of American Negroes in Africa. In 1811 he sailed for Sierra Leone in his ship, the *Traveler*, with a Negro crew, won favor there with both whites and Negroes, and instituted the Friendly Society of Sierra Leone, through which immigration could be introduced. In London he was warmly received by William Wilberforce and Thomas Clarkson, and commissioned by the African Institution to carry goods to Sierra Leone. In 1815 he sailed to Sierra Leone with nine families which settled there, but his health failed before he could do more.

CUGNOT, kü-nyō', Nicholas Joseph, French inventor: b. Poid, Meuse, Sept. 25, 1725; d. Paris, Oct. 2, 1804. He was a military engineer, and in 1765 with the aid of the elector of Saxony built a three-wheeled, steam-driven automobile to pull artillery. An improved model dating from 1770, which was designed to run at 25 miles per hour, is preserved in the Conservatoire des Arts et Métiers in Paris. The vehicle resembles a tricycle, with a large round boiler hung in front of the first wheel, which guides the vehicle, and there being two wheels behind. Cugnot was granted a pension by Louis XV in 1772, but this was withdrawn during the French Revolution, and the inventor went to live in Brussels.

CUI, Fr. kü-ē', César Antonovich (Russ. TSEZAR ANTONOVICH KYUI, kyōō-ē'), Russian composer and military engineer: b. Vilna, Lithuania, Jan. 18, 1835; d. St. Petersburg, March 24, 1918. He was the son of a French officer who remained behind after Napoleon's retreat from Russia and married a Lithuanian. Cui received an irregular early musical education at Vilna

from Stanisław Moniuszko, but he chose military engineering as a career, and in 1857 he graduated from the academy of engineering at St. Petersburg. He became a well-known authority on fortifications and held the rank of lieutenant general in the Russian Army.

Cui must be considered mainly self-taught in music, although soon after his graduation from the academy he became a friend and disciple of Mili Balakirev. With Balakirev, Cui was included in the group of Russian nationalistic composers called the "Mighty Five," although he did not apply the nationalistic principles of the Five to his own compositions, but rather was their exponent in a series of elegant, witty articles written for Russian, French, and Belgian journals.

Cui's compositions include works for orchestra, for chorus, chamber music, and 10 operas in the conventional romantic style, among them *The Captive in the Caucasus* (1859), *William Ratcliff* (1861), *Angelo* (1876), and *The Captain's Daughter* (1911). The characteristic delicacy and almost feminine tenderness of Cui's music appears to good advantage in his numerous songs.

Consult Seroff, V. I., *The Mighty Five* (New York 1948).

CUIRASS, kwè-rās', defensive armor protecting the body from neck to hips. The word is derived from the French *cuir* (leather), probably from the fact that at the time the term was coined the piece of armor was made of *cuir-bouilli* (leather hardened by boiling). Specifically the cuirass is a body defense consisting of a breastplate and a backplate held together by buckles, straps, or other means, and reaching to below the waist. The breastplate alone was sometimes called a cuirass, or the two pieces combined were called (a pair of) cuirasses and the breastplate a half-cuirass.

The word has been used as well, in a general sense, for all kinds of close-fitting defensive coverings for the torso, whether of leather, metal, or other material. Thus the term describes the bronze cuirass of the Greeks, the cuirasses with overlapping metal plates of the Romans, as well as the splinted body defenses of Asia (of which the silk-laced armor of Japan is a later development). But usually by cuirass is understood such forms of combined breastplates and backplates as those that developed in Europe during the 14th century and continued in use until the 20th century, having not only followed but influenced the styles and vicissitudes of man's dress during that time.

In the 17th century, as improving firearms made armor more and more ineffectual, the cuirass was gradually discarded until it was worn almost exclusively by the cavalry who were called cuirassiers; but the use of the cuirass has never altogether ceased. Certain regiments of guards still wear corresponding equipment on ceremonial occasions.

RANDOLPH BULLOCK.

CUIRASSIER, kwè-rā-sēr', a mounted soldier wearing a cuirass (q.v.). In European armies from the 17th century until World War I, cuirassiers was the proper name for a certain type of heavy cavalry which took the place of the lancers of the 16th century. Originally developed out of the fully armored men-at-arms forming the cavalry of feudal armies, the cuirassiers re-

tained their armor long after other troops had abandoned it—the cuirass (from which the name is derived) being worn to the last.

CUITLAHUAC, kwët-lä'wāk (also CUITLAHUATZIN, kwët-lä-wā'tsin'), Aztec emperor: b. about 1470; d. Tenochtitlan (Mexico City), September or October 1520. He was the younger brother of Montezuma II, emperor at the time of the arrival of the Spanish conquerors under Hernán Cortés. The Spaniards entered Tenochtitlan, the Aztec capital, and made Montezuma their hostage, but Cuitlahuac subsequently led an uprising against the invaders. Montezuma having been killed, Cuitlahuac was chosen to succeed him, and his warriors forced Cortés to abandon the city at the end of June 1520. Before the reconquest of Tenochtitlan by the Spaniards, Cuitlahuac died of smallpox after a reign of about three months and was succeeded by Cuauhtemoc, last of the Aztec emperors.

CUJACIUS, kû-yā'shî-ūs (original name JACQUES CUJAS, kû-zhās'), French juriconsult. b. Toulouse, France, 1522; d. Bourges, 1590. He studied at Toulouse and began teaching there in 1547. Subsequently he taught at Cahors, Bourges, Valence, and Turin. In 1575 he returned to Bourges, where he remained almost uninterruptedly until his death. Perhaps the most learned legal scholar of his time, Cujacius consulted and collected a great number of manuscripts, placing less reliance than his predecessors on the commentaries of others, more on a critical examination of the Roman law itself. He is regarded as a founder of the historical school of jurisprudence.

CULBERTSON, kûl'bért-s'n. **Ely**, American author, lecturer, and authority on contract bridge: b. Poyana de Vervilao, Rumania, July 22, 1891. His father was an American oilman who made a fortune in the Caucasian oilfields. Culbertson was educated in Russia and at Geneva and Paris, and later traveled widely, supporting himself by taking odd jobs. Finally at Geneva he was introduced to bridge and began making a systematic study of the game.

After the Russian Revolution, Culbertson settled in the United States, and in 1923 he married Josephine Murphy, also an authority on bridge. Together they formed a highly successful team which by challenging other experts to well-publicized matches did much to make bridge one of the most popular games in the United States. Culbertson captained American bridge teams in international matches in 1933-1934 and 1937.

Culbertson is the author of several extremely successful books on bridge, but he has also spent much time lecturing on international politics and peace, and was the founder of The World Federation. His works include an autobiography, *The Strange Lives of One Man* (1940); *The World Federation Plan* (1942); *Total Peace* (1943); and *Must We Fight Russia?* (1946).

CULDEES, kûl'dēz, a name applied to certain monks of the British Isles in the early Middle Ages. Their history is obscure. At first the term Culdee seems to have been given to anchorites living in communities like the one at Talaght, Ireland, in the 8th century; but, perhaps somewhat later, the name was assumed by secular canons whose communities were usually at-

tached to collegiate or cathedral churches and who seem to have made the care of the sick and poor their special task. Such Culdees lived in monastic fashion, but did not take monastic vows. From Ireland, toward the close of the 8th century, Culdees spread to Scotland, where they flourished, replacing the Columban monks who had been expelled in 717. There were also Culdean communities at York in England and Bardsey Island in north Wales. In Ireland there were communities at Clonmacnoise, Clondalkin, Clones, Armagh, Sligo, and Devenish and Scattered islands; in Scotland, at St. Andrews, Dunkeld, Loch Leven, Brechin, and other places. The 8th and 9th centuries were their greatest period. The original Culdees were eventually succeeded by wealthy communities of worldly, indolent men, and one by one, from the 11th century on, these were replaced by regular canons living under a strict monastic rule.

CULEBRA, kû-lâ'brâ, island, off the east coast of Puerto Rico. There is a United States naval base here. Pop. (1950) 877.

CULIACAN, kōo-lyâ-kân (officially CULIACÁN ROSALES), city, Mexico, capital of the state of Sinaloa. It is situated on a level plain beside the Culiacan River in a rich, semitropical agricultural region. After the subjugation of the Colhuas Indians, who inhabited the site upon the arrival of the Spaniards the town, which was founded in 1599, stagnated until the arrival of the railroad in 1908, entering into a period of rapid development soon thereafter. For this reason its architecture is essentially modern. Culiacan is connected by rail and road with other cities of the Pacific coast, and with Altata, a seaport with fine beaches, some 40 miles distant. Pop. (1940) 22,025.

CULIN, Robert Stewart, American anthropologist: b. Philadelphia, Pa., July 13, 1858; d. Amityville, New York, April 8, 1929. He was educated at a Friends' School and afterward at Nazareth Hall, Nazareth, Pa. Leaving this school at the age of 17, he engaged in business, but was soon persuaded to take up anthropological research. In 1883 he became secretary of the Numismatic and Antiquarian Society of Philadelphia and began a study of the Chinese in America, and wrote a report on their games. He made numerous scientific expeditions to Korea, Japan, China and India and among American Indian tribes. He became curator of the Museum of Science and Art of the University of Pennsylvania in 1889, and one of the foremost anthropologists of America. In 1892 he was appointed director of the Museum. After 1903 he was curator of ethnology at the Brooklyn Museum.

He published *Korean Games* (1896); *Mancala, the National Game of Africa* (1894); *American Indian Games* (1905).

CULINARY. See **COOKERY**.

CULLEN, kûl'ên, Countee, American poet: b. New York City, May 30, 1903; d. there, Jan. 9, 1946. He was educated in New York schools and received B.A. degree from New York University in 1925, and M.A. degree from Harvard University the next year. He began to write poetry under the influence of Keats and Tennyson. At 15 he took first prize in a contest conducted by

the Federation of Women's Clubs with *I Have a Rendezvous with Life*. In 1924 his *Ballad of the Brown Girl* won second prize in the Poetry Society of America contest, and the next year *Threnody for a Brown Girl* was awarded the John Reed Memorial Prize offered by Poetry. He received a Guggenheim fellowship to study in Paris in 1928. From 1926 to 1928 he was assistant editor of *Opportunity: A Journal of American Negro Life*, and from 1935 until his death taught French in the New York public schools. Cullen was one of America's best-known Negro poets; his work was not greatly influenced by racial feeling or racial speech.

His volumes of poetry include *Color* (1925); *The Ballad of the Brown Girl* (1927); *Copper Sun* (1927); *The Black Christ* (1929); *The Medea* (1935); *The Lost Zoo* (1940); and *My Lives and How I Lost Them* (1942). His only novel, *One Way to Heaven* (1932), is a story of an intensely religious young Negro woman who married an unbeliever.

CULLEN, Paul, Irish Roman Catholic prelate: b. Prospect, County Kildare, April 29, 1803; d. Dublin, Oct. 24, 1878. He was ordained priest in 1829, and filled in succession the offices of vice rector and rector of the Irish College in Rome, and rector of the Propaganda College. During the period of Giuseppe Mazzini's power in Rome in 1848, Cullen saved the property of his college by placing it under American protection. At the close of 1849 he unexpectedly found himself nominated to the archbishopric of Armagh and primacy of Ireland. His vigorous denunciations of Fenianism made him many enemies. He also forbade the clergy to take an active part in politics, and advocated papal infallibility. At the Synod of Thurles in 1851, principally by Cullen's persuasion, the establishment of a Roman Catholic university in Ireland was recommended, but his quarrel with Dr. Newman, its head, wrecked the scheme. Translated to Dublin in 1852, he was created a cardinal priest in 1866, the first Irishman who had reached that rank. One of the majority at the Vatican council, he long enjoyed the familiar friendship of Pope Pius IX.

CULLERA, kōo-lyâ'râ, commune, Spain, in the province of Valencia, and 24 miles south by east of Valencia, on the Júcar River near its entrance into the Mediterranean. Its natural position makes it a place of military importance, and though its fortifications have been repeatedly dismantled, they are now in an efficient state. Its streets are irregular but level, and among the noteworthy features are a ruined castle and the chapel of the Virgin de Cullera.

Fishing, agriculture and stock raising are the principal industries. The city is the center of a considerable trade in grain, rice, oranges, wine; and industries include distilling, furniture making, and leather goods manufacturing. Cullera was of great military importance under the Moors, by whom it was strongly fortified, and successfully withstood attacks of the Christian armies in 1234 and 1235, though later it was taken by James I of Aragon. Pop. (1940) 13,943.

CULLMAN, kûl'măn, city, Alabama, seat of Cullman County. 45 miles north of Birmingham, at an altitude of 800 feet, and served by the Louisville and Nashville Railroad. The shipping

point for an agricultural region raising cotton, corn, sweet potatoes, poultry, and strawberries. Cullman manufactures canned goods, men's and women's wear, mattresses, dairy products, lumber, and frozen goods. It is the seat of the Sacred Heart Junior College and Academy and has other excellent school facilities. Founded in 1873 it is governed by a mayor and council. Electric power is supplied by the Tennessee Valley Authority. Pop. (1950) 7,523.

CULLODEN MOOR, kŭ-lŏd"n, **CULLODEN MUIR**, or **DRUMMOSSIE MOOR**, a heath in Scotland, four miles east of Inverness. It is celebrated for a victory obtained April 16, 1746, by the duke of Cumberland over Prince Charles Edward Stuart (the Pretender) and his adherents. The Battle of Culloden was the last battle fought on British soil, and terminated the attempts of the Stuart family to recover the throne of England. A monumental cairn and green mounds have been raised where the fiercest of the fight raged, and where many of the slain are buried. The *Culloden Papers* were discovered at Culloden House, the family seat of Duncan Forbes a mile to the north. They cover the years 1625-1748, and were published in London in 1815.

Consult William Augustus, duke of Cumberland, *Authentic Account of the Battle of Culloden* (London 1746).

CULLOM, Shelby Moore, American senator: b. Monticello, Wayne County, Ky., Nov. 22, 1829; d. Jan. 28, 1914. In 1853 he went to Springfield, Ill., to study law, was admitted to the bar and settled in practice there. He was in the Illinois House of Representatives 1856, 1860, 1872, 1874, and its speaker in 1861 and 1873. He was elected to Congress 1865-1871. At the Republican national convention, 1872, he nominated Gen. U. S. Grant. He was governor of Illinois 1877-1883, when he was elected to the United States Senate, and re-elected 1888, 1894, 1900 and 1907. He was chairman of the Senate committee which reported the Interstate Commerce Bill, and a member of the commission appointed to prepare a system of laws for the Hawaiian Islands. His report on the regulation of railroad corporations by national legislation, presented to the Senate, Jan. 18, 1886, has taken its place as a permanent contribution to economic literature. He wrote *Fifty Years of Public Service* (2d ed., 1911).

CULLUM, kŭl'ŭm, George Washington, American military officer: b. New York, Feb. 25, 1809; d. there, Feb. 28, 1892. He was graduated from West Point in 1833; and was engaged for the next 28 years in engineering labors and in instructing at West Point in practical military engineering. During the Civil War he was chief of staff to the general in chief 1861-1864, and superintendent of the Military Academy 1864-1866. He was made chief engineer of the Department of the Missouri in 1861, superintended engineering work on the western rivers and was chief engineer at the siege of Corinth. From that time he was a member of the board of engineers for fortifications, until he was placed on the retired list in 1874. At the time of his retirement he was colonel and brevet major general in the Regular army.

Besides numerous military memoirs and reports, he published *Military Bridges with India-rubber Pontoons* (1849); *Register of Officers of the U.S. Military Academy from 1802 to 1850*

(1850); a translation of Duparc's *Elements of Military Art and History*, with notes (1863); a *Biographical Register of the Officers and Graduates of the United States Military Academy* (1850) (2d ed., 1868); *Campaigns of the War of 1812 Criticised* (1880). He bequeathed \$250,000 for the erection of a memorial hall on the grounds of the Military Academy, and \$40,000 for furnishing it with military busts, paintings and other appropriate objects and for the continuance of his *Biographical Register*.

CULM, a term used in the United States to designate waste anthracite coal, but in some parts of England for anthracite in general. At one time disposal of the culm heaps surrounding the shafts of the mines in Pennsylvania became a serious problem, until its use as fuel was made possible, either by burning it in special grates, or by pressing it into briquettes (q.v.). In England the culm is sometimes made up into balls, with one-third of the bulk of wet clay. This mixture burns without flame, and gives a steady heat suitable for cooking. In botany culm is the straw or hollow stem of the grasses.

CULMINATION, an astronomical term, signifying the passage of a star across the meridian. The star is then at the highest point (*culmen*) of its course; hence the name. The sun culminates at mid-day, or 12 o'clock, apparent solar time—which seldom agrees exactly with mean time, as shown by a watch or clock. The full moon culminates at midnight. The term is interchangeable with transit.

CULP, Julia, Dutch contralto: b. Groningen, Oct. 6, 1881. She first studied violin, and then singing with Cornelia van Zanten and Etelka Gerster. She appeared in several concerts in Berlin, and in 1901 made her formal debut with Busoni in Magdeburg. From then on she toured Germany, Austria, the Netherlands, France, Spain, and Russia, and was so successful that she became known as one of the greatest of "lieder" singers. In 1913 she paid her first visit to the United States and for some time thereafter undertook American tours each season. She was first married to Erich Merten and in 1919 married Willy Ginzkey. In 1937 she taught at the Vienna Music Academy, and in 1938 returned to Holland where she has been living in virtual retirement. In her prime she possessed a remarkable voice which she at all times kept under control. Her interpretations of German lieder were models of musicianship and of understanding of the context and the music.

CULPEPER, or **COLEPEPER**, Thomas, American royal governor: b. England, 1635; d. London, Jan. 27, 1689. He was one of King Charles II's favorites, and received from that monarch a grant of the entire territory of Virginia for a period of 31 years from 1673, a grant so astounding in magnitude that, in the opinion of at least one historian, nothing but the very deed itself, still extant, could be accepted as evidence of the fact. He was governor of Virginia 1682-1683, and two years later relinquished most of his Virginia grant, retaining only a portion called Northern Neck, and securing, instead of the remainder, an annual pension of £600 for 20 years. His whole career was actuated by the meanest rapacity, an example of which may be seen in his

trying to swindle the colonists by paying the public wages in light coin, on which he had himself put an arbitrary value. In 1683 he returned to England, was tried and convicted of corruption and deprived of his commission. His daughter Catherine married Lord Fairfax to whom the great estate descended.

CULTIVATION, in agriculture, is the breaking up of soil in preparation for crops, including certain other operations when crops are actually in being (after cultivation or intertilage). As plants obtain their food—except the carbonic acid gas taken from the air—from the thin films of moisture clinging to the soil particles, a fine state of division is requisite for a proper seed bed or tilth. This is greatly promoted by winter plowing, especially necessary in the case of heavy soils, for the action of frosts break up the clods very thoroughly. Cultivation also facilitates the free passage of air and water through the ground. See also FARM MACHINERY.

CULVER, kŭl'vēr, **CITY**, city, California, in Los Angeles County, eight miles southwest of Los Angeles, at an altitude of 81 feet, and served by the Pacific Electric Railway. It is a residential and industrial town, only 3.7 square miles in area, with the motion picture studios there attracting a good proportion of the business. Settled in the 1830's as a Spanish ranch for raising cattle, the lands eventually passed into American hands and Culver City was fashioned out of part of them in 1913. The first motion picture studios were established here in 1915 and the town was incorporated in 1917. Government is by mayor and council. Pop. (1950) 19,720.

CULVERIN, kŭl'vēr-ĭn, in early times, any small gun, the name being derived from the serpent-shaped handles cast on the piece. In the 16th century and later the name was used with reference to the heavier cannon, like the 18-pounder. Variations of the name were whole culver or culver, referring to the heavier guns, demi-culverin to the smaller.

CULVERT, kŭl'vĕrt, an artificial channel for carrying a small stream underneath a canal or the embankment of a roadway or railway. For very small streams vitrified clay pipe or cast-iron pipe is used for culverts. For streams of larger size stone box culverts are employed, consisting of two parallel masonry walls covered over with stone flagging and having a paved bottom. Where stone is scarce, box culverts are sometimes built of timber, and sometimes, instead of stone flagging, a roof of iron beams embedded in a concrete slab is employed. Large culverts are usually built with parallel masonry side walls, supporting a stone or brick roof arch. A culvert, besides the passageway for the water, has wing walls at one or both ends to hold the embankment in place and protect it from the rush of the flowing water in times of freshet.

CUMAE, kŭ'mĕ, a very ancient city in Campania, and the oldest colony of the Greeks in Italy was founded about 1030 B.C., according to ancient authorities, by colonists from Chalcis in Euboea and from Cyme in Asia Minor. Strabo tells us that it was the oldest of all Greek settlements in either Italy or Sicily. They soon spread out, and founded Zancle in Sicily (better known

as Messina), and Naples. Its wealth and prowess invited a joint attack in 524 B.C. by the Etruscans of Capua, the Daunians of Nola and the Aurunci of Mons Massicus, which resulted in a victory for Cumae. In 420 B.C., Cumae was taken by the Campanians and became Oscan in character. With the Campanians, it came under the power of Rome (345 B.C.) and lost its identity. During the Second Punic War, it resisted the attacks of Hannibal. Thenceforth it remained a quiet suburb where the politicians of Rome had their villas. Its strong fortifications made it an important military factor, but it was finally destroyed by the Neapolitans in 1205 A.D. All that remains of the city are some ruins of an amphitheater, of a small temple and masses of masonry, evidently of Roman construction. Considerable remains of the ancient fortifications are visible, and underneath the Acropolis are numerous crypts. The common belief of the inhabitants made Cumae the home of the Cumaean sibyl, a most renowned ancient prophetess; and one of these caverns was supposedly her seat. The extensive cemeteries of the city have proved of great interest to archaeologists who have unearthed Greek, Samite and Roman graves and many important objects, which establish the fact that some sort of pre-Greek settlement existed there.

CUMANA, kōō-mā-nā', seaport city, Venezuela, capital of the State of Sucre, which formerly constituted a section of the State of Bermúdez. It was founded by Gonzáles Ocampo in 1520, under the name of Nueva Toledo, and near Nueva Cordoba, founded in 1523 by Diego Castellón. It is situated on the banks of the Manzanares River, one mile from the southern coast of the Gulf of Cariaco. The city is celebrated as being the first permanent settlement of Europeans on that coast. Being situated on ground of volcanic formation, the city is subject to frequent earthquakes. The surrounding country is fertile, producing especially fine grapes, pineapples and other fruits, and such tropical plants as coffee and cacao. A railroad connects the city with the gulf. It has a college and is the seat of a United States consular agent. It is an important commercial center, its trade being promoted by an excellent roadstead and harbor, which are dominated by the fort of San Antonio on a hill overlooking the town. The exports are cacao, sugar, coconuts, tobacco, pearls and hides. There is a cotton mill in Cumaná. Pop. (1950) 46,416.

CUMARIN. See COUMARIN.

CUMBERLAND, Richard, English dramatist and essayist: b. Cambridge, Feb. 19, 1732; d. Tunbridge Wells, May 7, 1811. He was graduated at Trinity College, Cambridge, in 1750, and two years afterward was elected fellow. He was appointed private secretary to the earl of Halifax, became Ulster secretary during Halifax's term as lord lieutenant of Ireland. In 1775 he obtained a post in the Board of Trade and retired to Tunbridge Wells, where he devoted himself to literature. His comedies, *West Indian* (1770); *Wheel of Fortune*; *The Jew and Fashionable Lover* (1772), are an epitome of the culture of the time; as are his essays, collected under the title of *The Observer*. He wrote novels, tracts, religious and didactic poems, not now important; *Anecdotes of Eminent Painters in Spain*. His plays, though popular in their day, have not survived. His

Memoirs appeared in 1807, but are considered untrustworthy.

Consult Paston, George, *Little Memoirs of the Eighteenth Century* (London 1901).

CUMBERLAND, the extreme northwest county, England. It has 75 miles of coast and an area of 1,520 square miles. A little more than half of the county is cultivated, the rest is covered by mountain and lake. The highest peaks of the Cumbrian Mountains are in the lake region, whence valleys radiate in all directions, gradually ending in a flat coastal belt. The chief rivers are the Ehen and Derwent. Mineral wealth abounds, chiefly coal, iron and lead. Dairy farming and domestic manufactures are carried on. The chief towns are Carlisle, the capital, Whitehaven, Brampton, Workington, Maryport and Millom. Pop. (1951 est.) 217,453.

CUMBERLAND, city, Maryland, and seat of Allegany County, 178 miles west by north of Baltimore; on the Potomac River, 641 feet above tidewater; served by the Baltimore and Ohio, Western Maryland, Pennsylvania, and Cumberland and Pennsylvania railroads, and at the western end of the Chesapeake and Ohio canal (completed in 1850) from Georgetown, D.C. It is on two federal highways, and for nearly 200 years has been on a main thoroughfare to the Ohio country and western Pennsylvania. West of the city is a beautiful gorge, "The Narrows," making it a gateway to the West. Cumberland ships sand, lime, clay, and fruit from western Maryland; and it has a large jobbing business. In manufacturing, as in population, it is the second city of Maryland. There are mills for re-rolling steel rails and other materials of railway supplies, railway car and repair shops. Other major products are celanese, underwear, macaroni, precision tool drills, wool products, glass, cement, tires and tubes. The city has beautiful fair grounds.

On Wills Creek here in 1754 Col. James Imes built Fort Cumberland (named in honor of the duke of Cumberland, son of George II) to be an outpost against the French and Indians. The fort was Braddock's starting point in his disastrous march of July 1755. Even in the colonial period, a wagon trail through the gorge here led from Lancaster, Pa., to the West. The Cumberland Road or National Pike was planned by George Washington. In 1818 it was opened from Cumberland to Wheeling, W. Va. The building of the Chesapeake and Ohio Canal and of its rival, the Baltimore and Ohio Railroad helped develop Cumberland. It had been laid out in 1763, was incorporated as a town in 1815, and became a city in 1850, when its population was about 6,000. In 1910 Cumberland adopted the commission form of government—the first city in Maryland to do this. There is a commission of a mayor and four councilmen. Pop. (1940) 39,483, (1950) 37,679.

CUMBERLAND, township, Rhode Island, in Providence County; traversed by the Blackstone River; approximately 6 miles north of Providence; on the New York, New Haven, and Hartford Railroad. Manufacturing establishments within the township produce cotton, worsted, silk, and rayon goods, nuts, bolts, and wire products; farming in this portion of the state is a highly specialized industry. Valley Falls is the seat of

government for Cumberland Township. Cumberland was formerly a part of Rehoboth, Mass., and was sometimes called Attleboro Gore. It was annexed to Rhode Island in 1746, and incorporated as a township in 1747. Pop. (1950) 12,842.

CUMBERLAND, river, in southern Kentucky and northern Tennessee, formed on the Cumberland Plateau by the confluence of two forks north of Harlan, Ky. Flowing in a general westerly direction, it drains an area of 18,080 square miles and empties into the Ohio River in western Kentucky. Near Corbin, Ky., it flows through Cumberland Falls State Park, where it drops 68 feet at Cumberland Falls. It is 693 miles long and is navigable 461 miles upstream to Wolf Creek Dam. The chief cities on its course are Nashville and Clarksville, Tenn.

CUMBERLAND, Army of the. See **STONE RIVER**, OF MURFREESBORO, BATTLE OF.

CUMBERLAND GAP, a pass through the Cumberland Plateau in Clairborne County, Tenn., near the border of Virginia, Kentucky, and Tennessee, about 45 miles from Knoxville. Its altitude is 1,315 feet. Discovered by Dr. Thomas Walker in 1750, it was an important gateway to the West in pioneer days (see **WILDERNESS ROUTE**). During the Civil War it was occupied by the Confederates until June 1862, when it was evacuated and taken by Union forces. After two months it was recaptured by the Confederates, but on Sept. 9, 1863 it was again taken by the Federals and held for the duration of the war.

CUMBERLAND HOUSE, the first Hudson's Bay Company post operated in the interior, was built by Samuel Hearne in 1744 on Cumberland Lake in the Saskatchewan Valley. The post was established to meet competition from Montreal traders and was located near the junction of the great fur trade routes of the period. The oldest permanent settlement in Saskatchewan, it has been occupied continuously by the Hudson's Bay Company. Prior to 1821 it was the residence of the governor of Rupert's Land.

CUMBERLAND LAKE, a lake in Saskatchewan, Canada, near the eastern border of the province, about 50 miles south of Flin Flon, Manitoba. It drains south into the Saskatchewan River.

CUMBERLAND PENINSULA, on Baffin Island, Franklin District, Northwest Territories, Canada, extends eastward into Davis Strait about 200 miles, forming the north shore of Cumberland Sound. The region is mountainous with altitudes of over 8,500 ft. Pangnirtung trading post, the medical center for Baffin Island, is at the head of Pangnirtung Fjord on the southern coast, and an air base is located on Padloping Island off Merchant's Bay in the north.

CUMBERLAND PLATEAU or **MOUNTAINS**, that section of the Appalachian Mountains which ranges along the southwest border of Virginia and southwestern Kentucky and extends across Tennessee into northern Alabama. The highest point in this region is Big Black Mountain (alt. 4,150 ft.), which is part of a series of ridges about 150 miles long on the southeast margin to which the name Cumberland Mountains is

usually limited. Southwest of the Cumberland Mountains are Crab Orchard Mountains (Tenn.), Sand Mountain (Ala.), and the scenic Lookout Mountain (q.v.). The Cumberland and Kentucky rivers rise on the plateau, and part of the region is drained by the Tennessee River. The chief products of the Cumberland Plateau are coal and timber.

CUMBERLAND PRESBYTERIAN CHURCH. See PRESBYTERIAN CHURCH IN THE UNITED STATES OF AMERICA.

CUMBERLAND ROAD (also called the UNITED STATES ROAD or NATIONAL ROAD), the first national road in the United States, extending from Cumberland, Md., northwestward through Pittsburgh to Ohio and points farther west. It followed in part two earlier trails, Nemocolin's Path or Cresap's Road—after Nemocolin, a Delaware Indian, who made it for Col. Thomas Cresap, an agent for the Ohio Company—which was used by Washington in 1753 to deliver a message from the governor of Virginia to the French at Fort Duquesne; and Braddock's Road, made two years later by General Braddock's army on the way to Fort Duquesne.

After the Revolution, demand for a thoroughfare westward through the Appalachians increased, and in 1806, Congress provided for laying out and building the Cumberland Road. The work was contracted in 1811 but was not started until 1815. Opened in 1818, the road extended from Cumberland to Wheeling (now in W. Va.). Its continuation into Ohio, commonly called the National Road, followed the first Ohio road, Zane's Trace, and was undertaken chiefly through the efforts of Henry Clay. After the bill to enable the federal government to levy tolls was vetoed by President Monroe in 1822, the states took over its control, and the road was extended westward to Vandalia, Ill., making it 591 miles long. Its route forms part of the modern United States Highway 40.

CUMBERLAND UNIVERSITY, a co-educational institution located at Lebanon, Tenn. It was first opened in 1842 as a liberal arts college and preparatory school. The law school (approved by the American Bar Association, 1952) was opened in 1847. In 1852 the engineering and theological schools were established, but the latter was discontinued in 1909. A school of music was formed in 1903. Coeducational since 1897, Cumberland University has an average enrollment of 425 students, and the faculty numbers about 25. Its general and departmental libraries total about 20,000 volumes. The university is under a self-perpetuating board of trustees.

CUMBRAES, The, kŭm-brāz'; kŭm'brāz, two islands in Scotland, part of Buteshire, located in the Firth of Clyde between the mainland of Ayrshire and the southern part of Bute Island. Together they cover an area of 5.5 square miles. The town of Millport is on the southern coast of GREAT CUMBRAE, where fishing and agriculture are the chief pursuits. LITTLE CUMBRAE, just south of it, has a lighthouse, and the ruins of an old tower still stand on Castle Island, off its eastern shore. Pop. (1951) 2,079.

CUMBRIAN MOUNTAINS, kŭm'brī-ān, range of hills, England, occupying parts of the

counties of Cumberland, Westmorland, and North Lancashire, about 37 miles long and 35 miles wide. Interspersed with fertile valleys and numerous picturesque lakes, this region is known as the English Lake District, made famous by the Lake School of Poets (q.v.). Its largest lake is Windemere, and its highest peak, Scafell Pike (3,210 ft.) is the loftiest summit in England.

CUMIN, kŭm'in (also CUMMIN; Lat. *Cuminum*; Gr. *Kyminon*), an herb of the parsley family, Umbelliferae. It has long been cultivated in Mediterranean countries and more recently in India and Argentina for its seedlike fruits which resemble those of caraway. The fruits have a bitterish, warm taste and aromatic flavor. They are used in soup, curries, cake, bread, cheese, and pickles, and are often candied. The oil is used in perfumery and for flavoring beverages.

CUMMINGS, kŭm'ingz, Bruce Frederick (pseudonym W. N. P. BARRELLION, bār-bēl'yŭn), English diarist: b. Barnstaple, England, Sept. 7, 1889; d. Gerrard's Cross, Buckinghamshire, Oct. 22, 1919. A biologist and contributor to scientific journals, he was employed from 1911 at the Natural History Museum, South Kensington. Cummings is best known for his voluminous diaries, extracts from which were published as *The Journal of a Disappointed Man* in 1919, the year he died of an incurable disease. These diaries reveal a sensitive and courageous personality faced with constant ill-health and little outlet for his intellectual interests and ambitions. Posthumous publications were *Enjoying Life and Other Literary Remains* (1919) and *A Last Diary* (1920).

CUMMINGS, Edward Estlin, American poet and painter: b. Cambridge, Mass., Oct. 14, 1894. After graduating from Harvard (B.A. 1915; M.A. 1916), he joined an American ambulance corps in France, where for several months in 1917 he was mistakenly imprisoned as a spy. On this experience he based his novel, *The Enormous Room* (1922). He studied painting in Paris after World War I and returned to New York in 1924. In 1931 he published a book of his drawings and paintings entitled *CIOPW*, using the first letter of each media contained therein: charcoal, ink, oil, pencil, and watercolor. His paintings have been exhibited at the American British Art Centre (1949) and the Rochester Memorial Gallery (1950).

Cummings' poetry displays a natural lyric gift, but is often rendered obscure by typographical eccentricities, such as omission of capital letters and unconventional spacing. Among his books of verses are *Tulips and Chimneys* (1923); *XLI Poems* (1925); *Is 5* (1926); *Christmas Tree* (1928); *No Thanks* (1935); *Collected Poems* (1938); *1 x 1* (1944); *Santa Claus* (1946); and *Xaïpe* (1950). Other works include *him* (1927), a drama in 21 scenes; *Tom* (1935), a satirical ballet based on *Uncle Tom's Cabin*; and *Eimi* (1933), a diary of his trip to Russia, in which he attacks Soviet regimentation.

CUMMINGS, Homer Stillé, American government official: b. Chicago, Ill., April 30, 1870. He graduated from Yale (1891) and, after receiving his law degree there (1893), was admitted to the bar and began to practice in Stamford, Conn. He served three terms as mayor of Stamford

(1900-1901; 1901-1902; 1904-1906), and for 25 years was a member of the Democratic national committee, serving as its chairman from 1919 to 1920. He was state's attorney for Fairfield County, Conn., from 1914 to 1924.

After the victory of the Democratic Party in 1932, President Roosevelt appointed Cummings United States Attorney General. His career in this office was marked by improvements in the federal prison system, including the establishment of Alcatraz as a federal penitentiary; the broadening of federal jurisdiction in respect to kidnaping and interstate crime; and the increased efficiency of the Federal Bureau of Investigation (FBI). He retired in 1939. Among Cummings' publications are *Liberty Under Law and Administration* (1934); *We Can Prevent Crime* (1937); and *The Tired Sea* (1939).

CUMMINGS, Thomas Seir, American painter: b. Bath, England, Aug. 26, 1804; d. Hackensack, N. J., Sept. 24, 1894. When Cummings was a child, his family immigrated to New York City, where he later studied drawing with Augustus Earle and John Rubens Smith, and miniature painting with Henry Inman. He was one of the founders of the National Academy of Design in 1825 and its treasurer for 40 years. In New York he also conducted a private school of design, taught at the University of the City of New York, and in 1844 helped to organize the New York Sketching Club. His works include a portrait of Daniel Seymour and a miniature portrait of the artist Alfred T. Agate.

CUMMINS, kŭm'inz, Albert Baird, American lawyer and statesman: b. Carmichaels, Pa., Feb. 15, 1850; d. Des Moines, Iowa, July 30, 1926. He graduated from Waynesburg College, Pa., and after trying several occupations, began to study law in 1873. Two years later he was admitted to the bar. Twice an unsuccessful candidate for United States senator (1894 and 1899), he won the governorship of Iowa in 1902 and was re-elected for two succeeding terms thereafter. During this incumbency he secured the power of the Republican progressive wing in Iowa politics.

In 1908, Cummins was elected to the United States Senate, where his name is remembered chiefly for the Esch-Cummins Act of 1920, which transferred control of railroad properties from the government to private management. His defeat in 1926 brought to a close a distinguished senatorial career, during which he served as president pro tempore from 1919 to 1925 and for the last two years of that period as presiding officer after Vice President Coolidge became president.

CUMMINS, George David, American clergyman: b. near Smyrna, Del., Dec. 11, 1822; d. Lutherville, Md., June 26, 1876. After graduating from Dickinson College, Pa., he entered the Methodist Church, but in 1845 changed his affiliation to Episcopal and was ordained deacon in St. Andrew's Church, Wilmington, Del. In 1847 he was elected rector of Christ Church, Norfolk, Va., and in the same year was ordained priest at Wilmington. After leaving Norfolk in 1853, he served several important churches and in 1866 was elected assistant bishop of the diocese of Kentucky. While holding this office he witnessed the growing influence of the Ritualists in re-establishing pre-Reformation usages in the Episcopal Church. Fearing the subversion

of evangelical religion in this course, he left the Episcopal Church in 1873 and became the presiding officer of the Reformed Episcopal Church, which he served for the remainder of his life. See REFORMED EPISCOPAL CHURCH

CUMMINS, Maria Susanna, American novelist: b. Salem, Mass., April 9, 1827; d. Dorchester, Mass., Oct. 1, 1866. She is remembered chiefly for her novel *The Lamplighter* (1854), which gained an immense popularity in the United States, and was republished in England, France, and Germany. She was also the author of *Mabel Vaughan* (1857), *El Furcibus* (1860), and *Haunted Hearts* (1864).

CUMONT, kü-môn', Franz Valéry Marie, Belgian historian of religion: b. Aalst, East Flanders, Jan. 3, 1868; d. Brussels, Belgium, Aug. 25, 1947. Professor at the University of Ghent (1892-1910) and curator of the Musée Royale du Cinquantenaire in Brussels (1899-1912), Cumont made notable contributions to the study of eastern religious cults prevalent in Rome about the beginning of the Christian era. His most important work was *Textes et monuments figurés relatifs aux mystères de Mithra* (Paris 1894-1900). Other publications include *Astrology and Religion Among the Greeks and Romans* (New York 1912); *Afterlife in Roman Paganism* (New Haven 1922); *Recherches sur le symbolisme funéraire des romains* (Paris 1942); and the posthumous *Lux Perpetua* (Paris 1948).

CUMULATIVE VOTING, in the United States, a plan whereby an individual voter may cast as many votes for a single candidate as there are seats to be filled, in a district electing several persons (such as representatives or school board members). A minority party (or faction) may concentrate its strength (called "plumping") on a single nominee and thus assure his election. This plan operates in Illinois, where each district elects three members of the lower house of the legislature. It was used in the 19th century in Great Britain for school board elections. See MINORITY AND PROPORTIONAL REPRESENTATION.

CUNARD, kü-närd', Sir Samuel, British shipowner: b. Halifax, Nova Scotia, Nov. 21, 1787; d. London, England, April 28, 1865. While a merchant in Halifax, where he owned a fleet of whaling ships, he proposed in 1830 the idea of running mail steamers between England and America. Nine years later this scheme was carried out in England when Cunard, with George Burns, David MacIver, and others, formed the British and North American Royal Mail Steam Packet Line, which provided the first regular intercontinental steamship service. In 1840 four ships were commissioned, the first passage being made from Liverpool to Boston by the *Britannia*. This was the beginning of the famous Cunard Line (since 1934 the Cunard White Star Ltd.). In 1859 Cunard was created baronet.

CUNAXA, kü-näk'sä, town, Babylonia, near the Euphrates, about 87 miles north of Babylon. It is famous in history as the scene of the defeat of Cyrus the Younger (q.v.) in 401 a.c.

CUNDINAMARCA, kŭn-dē-nä-mär'kä, department, Colombia, situated just west of the Magdalena River on an elevated plateau which

forms part of the eastern Cordillera of the Andes. Its capital is Bogotá, which is also the capital of the republic. Among the varied agricultural products of the region are wheat, corn, potatoes, bananas, sugarcane, tobacco, rubber, cotton, and coffee. Mineral resources include salt, coal, iron, sulphur, gold, and zinc. Pop. (1952 est.) 1,526,630.

CUNEIFORM WRITING. The cuneiform system of writing was probably originated by the Sumerians. The oldest inscriptions unearthed to date—over one thousand tablets and fragments from about 3000 B.C.—are in all likelihood written in the Sumerian language. But whether or not it was the Sumerians who invented the script, it was certainly they who in the course of the 3d millennium B.C. fashioned it into an effective writing tool. Its practical value was gradually recognized by the surrounding peoples, who borrowed it from the Sumerians and adapted it to their own languages. By the 2d millennium B.C. it was current all over the Near East.

Development of the Script.—The cuneiform script began as pictographic writing; each sign was a picture of one or more concrete objects and represented a word whose meaning was identical with, or closely related to, the object pictured. The defects of a system of this type are obvious: it is rendered too unwieldy for practical use by the complicated form of the signs and the huge number of signs required. The Sumerian scribes overcame the first difficulty by gradually simplifying and conventionalizing the form of the signs until their pictographic original was no longer apparent. As for the second difficulty, they reduced the number of signs and kept it within effective limits by resorting to various helpful devices. The most significant of these consisted of substituting phonetic for ideographic values. The accompanying table was especially prepared to illustrate this twofold development in the course of the centuries. Thus proceeding from top to bottom:

(1) is the picture of a star; it represents primarily the Sumerian word *an*, "heaven." The very same sign, however, is used to represent the word *dinqr*, "god."

(2) represents the word *ki*, "earth." Obviously it is intended to be a picture of the earth, although the interpretation of the sign is still uncertain.

(3) is probably a more or less stylized picture of the upper part of a man's body; it represents the word *lu*, "man."

(4) is a picture of the pudenda; it represents the word *sal*, "pudenda." The same sign is used to represent the word *munus*, "woman."

(5) is the picture of a mountain; it represents the word *kur*, whose primary meaning is "mountain."

(6) illustrates the ingenious device developed early by the inventors of the Sumerian system of writing, whereby they were enabled to represent pictorially words for which the ordinary pictographic representation entailed a certain amount of difficulty. As the reader will note, the sign for the word *geme*, "slave-girl," is actually a combination of two signs, that for *munus*, "woman," and that for *kur*, "mountain"; that is, of signs 4 and 5 on our table. Literally, therefore, this compound sign expresses the idea "mountain-woman." But since the Sumerians obtained their slave-girls largely from the mountainous regions about them, this compound sign adequately represented the Sumerian word for "slave-girl," *geme*.

(7) is the picture of a head; it represents the Sumerian word *sag*, "head."

(8) is also the picture of a head; the vertical strokes, however, underline the particular part of the head which is intended, that is, the mouth. The sign, therefore, represents the Sumerian word *ka*, "mouth." The same sign naturally enough represents the word *dag*, "to speak."

(9) is probably the picture of a bowl used primarily as a food container; it represents the word *ninda*, "food."

(10) is actually a compound sign consisting of the signs for mouth and food (nos. 8 and 9 on our table); it represents the word *ku*, "to eat."

(11) is a picture of a water stream; it represents the

	I	II	III	IV	V
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Cuneiform writing.

word *a*, "water." This sign furnishes an excellent illustration of the process by which the Sumerian script gradually lost its unwieldy pictographic character and became a phonetic system of writing. As just said, the sign No. 11 was used primarily to represent the Sumerian word *a*, "water." However, the Sumerians had another word *a*, which was identical in pronunciation with the word *a*, "water," but which had the entirely different meaning "in." This word "in" is a word denoting relationship and stands for a concept which is very difficult to express pictographically. To the originators of the Sumerian script then came the ingenious idea that instead of trying to invent a necessarily highly complicated picture-sign to represent the word "in," they could use the sign for *a*, "water," since both words sounded exactly alike. In other words, the early Sumerian scribes came to realize that a sign originally belonging to a given word could be used for another word with an altogether unrelated meaning, if the sound of the two words were identical. With the gradual spreading of this practice, the Sumerian script lost its pictographic character and tended more and more to become a purely phonetic script.

(12) is a combination of the signs for "mouth" and "water" (nos. 8 and 11); it represents the word *nag*, "to drink."

(13) is a picture of the lower part of the leg and foot in a walking position; it represents the word *du*, "to go," and also the word *pub*, "to stand."

(14) is a picture of a bird; it represents the word *mushen*, "bird."

(15) is a picture of a fish; it represents the word *ha*,

"fish." This sign furnishes another example of the phonetic development of the Sumerian script. For the Sumerian word *ha* not only has the meaning "fish" but also "may"; that is, the Sumerians had two words *ha* which were identical in pronunciation but quite unrelated in meaning. And so, early in the development of the script the Sumerian scribes began to use the sign for *ha*, "fish," to represent the phonetically sounded *ha*, "may," just as with sign no. 11 they used the sign for *a*, "water," to represent the word *a*, "in."

(16) is a picture of the head and horns of an ox; it represents the word *gud*, "ox."

(17) is a picture of the head of a cow; it represents the word *ab*, "cow."

(18) is the picture of an ear of barley; it represents the word *she*, "barley."

The signs in the first column which we have examined in detail are from the earliest period in the development of Sumerian writing known to date. Not long after the invention of the pictographic script, however, the Sumerian scribes found it convenient to turn the tablet in such a way that the pictographs lay on their backs. As the writing developed, this practice became standard and the signs were regularly turned 90 degrees. The second column in our table gives the pictographic signs in this turned position. The third column represents the "archaic" script current about 2500 B.C. The sign forms shown in the fourth column are those in vogue in the days of the great lawgiver Hammurabi, who reigned about 1720 B.C., while the more simplified signs of the last column are those used by the royal scribes of Assyria in the 1st millennium B.C.

Method of Writing.—The common material used for writing was the clay tablet. It varied in shape and size throughout the centuries in accordance with practical need and scribal tradition; one of the most common forms was the oblong tablet with a flat obverse and a convex reverse. The writing implement was the reed stylus with a rectangular or triangular writing end which was pressed into the clay in a manner that formed a wedge-shaped impression. When the inscription began, the tablet was moist and soft; if small it was held in the hand; if large it was placed on a wooden support. Once inscribed, the tablet was usually put in the sun to dry; more important tablets were sometimes burned in a kiln. In addition to tablets, clay cones, prisms, and cylinders were also utilized. Royal inscriptions were frequently engraved on limestone, marble, or diorite with a metal chisel or some similar tool of hard stone. A preliminary copy, to be used by the engraver as guide, was often prepared on clay.

Writing Practice.—Cuneiform writing was an art practiced by a group of specially trained men known as scribes, who had spent most of their youth in special schools known as "tablet-houses." The novice began by practicing patiently to write the simple signs, in imitation of copies prepared by the school master and his assistants. Over the years he learned to read and write numerous specially prepared lists consisting of practically every type of useful cuneiform combination: lists of trees, stones, minerals, places, gods, kings, animals, artifacts, grammatical phrases, and metric and mathematical tables. In addition he copied and memorized extracts from all the more important literary works: myths, epics, hymns, proverbs, and essays. School life was not easy, and as one ancient "schoolman" reports, he took many a "caning" in his student days. But the reward was worth the effort; as one Sumerian proverb puts it: "Tablet writing is the mother of orators, the father of scholars."

Rediscovery.—The cuneiform system of writing went out of use by the 1st century B.C., and its very existence remained unknown for almost two thousand years. It was rediscovered and deciphered in the first half of the 19th century as a result of archaeological activity in Persia and Iraq. The crucial "key" to the script was provided by a number of trilingual inscriptions written in Persian, Elamite, and Babylonian, particularly the Behistun rock inscription of Darius the Great, which dominates the high road from Persepolis to lower Mesopotamia.

DR. SAMUEL N. KRAMER,
University Museum, Philadelphia, Pa

CUNENE or **KUNENE**, *kōō-nā'nē*, river, South Africa, rises in about latitude 13° S., flows south and west, and enters the Atlantic in latitude 17° 20' S., forming in its lower course the boundary between Angola and South-West Africa. It is about 700 miles long and has numerous cataracts, the largest being Rua Cana, which falls about 400 feet.

CUNEO, *kōō-nā-ō* (Fr. *CONI*, *kō-nē'*), commune, Italy, capital of the province of the same name, in Piedmont, 50 miles south of Turin. Located near the foot of the Alps at the confluence of the Stura and Gesso rivers, it is a busy rail and road junction and an industrial and trade center. Cuneo is one of the chief raw-silk markets of Italy and exports chestnuts all over the world. Industrial establishments include metallurgical and food-processing plants, breweries, and distilleries. Its old churches, including a Gothic cathedral, were restored in the 17th and 18th centuries.

Cuneo was founded about 1200 as a free commune but, after various struggles with neighboring towns, lost its independence to the Angevins in 1259. In 1382 the city was taken by the House of Savoy. Between the 16th and 17th centuries Cuneo suffered seven sieges at the hands of the French, in five of which it was victorious. Pop. (1951) 39,730.

CUNEO, province, Italy, covers an area of 2,669 square miles in Piedmont. It is mostly mountainous, as the Maritime and Cottian Alps cover more than half the region. It is a leading sericultural district of Italy. Chief crops are grain, forage, grapes, and truffles. An area of 202 square miles with a population of 4,274, including Briga and Tenda, was lost to France by the Peace Treaty of 1947. Pop. (1951) 580,424.

CUNHA, *kōō'nyá*, **Euclides da**, Brazilian writer: b. Santa Rita do Rio Negro, Brazil, Jan. 20, 1866; d. Rio de Janeiro, Aug. 15, 1909. Educated at the Colégio Aquino, Cunha published his earliest literary endeavors (mostly poetry) in the school paper *O Democrata*. During the years prior to the republican revolution in Brazil he was strongly influenced by the ideas of Herbert Spencer and the Brazilian statesman, Benjamin Constant, and developed antimilitaristic convictions which he displayed while a student at the military school by throwing his sword at the feet of the minister of war (1888)—an act for which he was court-martialed and dismissed from the army. After the proclamation of the republic, he was reinstated in the army, but resigned in 1896 to devote himself to civil engineering and to writing.

At the outbreak of the rebellion in Canudos by the followers of the fanatical mystic, Antonio Conselheiro, Cunha accompanied the federal troops as an observer and reporter for the *Estado de São Paulo*. He recorded his experiences of this campaign in the novel *Os Sertões*. Published in Rio de Janeiro in 1902, this work is one of the classics of Brazilian literature, significant for its exhaustive study of the social psychology of Brazil. Seven years later Cunha was mysteriously shot to death soon after he had begun to teach in the Pedro II Institute in Rio de Janeiro. His other writings include *Perú versus Colombia* (1907); *Castro Alves e seu tempo* (1908); and *A margem da história* (1909).

For an English version of *Os Sertões* consult the translation by Samuel Putnam, *Rebellion in the Backlands* (Chicago 1944). Consult also Freyre, G., *Atualidade de Euclides da Cunha* (Rio de Janeiro 1942).

CUNHA, Tristão da, Portuguese navigator: b. about 1460; d. about 1540. Named viceroy of India by the Portuguese king, John II, he left for India in 1506 in command of 16 ships. On the way he discovered a group of three islands which bear his name (see also TRISTAN DA CUNHA), and visited Madagascar, Mozambique, and Zanzibar. He was a member of the Portuguese Royal Council and in 1514 headed a Portuguese mission to the court of Pope Leo X.

CUNNER (*Tautoglabrus adspersus*), a brownish-blue wrasse of the family Labridae, with scaly cheeks, serrate preopercle, and strong, sharp teeth. It is an abundant shore fish, usually to be found over rocks or around pilings from Labrador to Chesapeake Bay. It spawns in June and July and reaches maturity in about three years. It feeds on fish, crustacea, mollusks, and also on seaweed. The cunner grows to a length of 15 inches; its maximum weight is under three pounds.

CUNNINGHAM, kün'ing-äm, Alexander, 5TH EARL OF GLENCAIRN, glén-kärn', Scottish leader of the Reformation: d. Nov. 23, 1574. He was a zealous supporter of John Knox and in 1559 prevented the queen dowager, Mary of Guise, from attacking the reformers at Perth. Although elected to the privy council of Mary, Queen of Scots, in 1561, he stood firm in defense of Protestantism; he assisted in the attack on Edinburgh (1565) and commanded one of the divisions at the Battle of Langside (1568). During the minority of James VI. Cunningham was imprisoned after the fall of the regent Matthew Stewart, 4th earl of Lennox (1571), but was soon rescued and in the same year nominated for the regency, which he lost to James Douglas, 4th earl of Morton.

CUNNINGHAM, Allan, Scottish poet and man of letters: b. Keir, Dumfriesshire, Scotland, Dec. 7, 1784; d. London, England, Oct. 30, 1842. Apprenticed to a stonemason as a youth, he read and wrote poetry in his spare time. After giving several original poems disguised as old Scottish songs to Robert Cromek, the ballad collector, he came to London on the latter's advice in 1810, and thereafter published songs, stories, romances, and occasional pieces. In 1814 he became secretary to the sculptor Francis Legatt Chantrey. His publications include *Traditional Tales of the English and Scottish Peasantry* (1822) and *The Songs of Scotland, An-*

cient and Modern (1825), which contains the sea song *A Wet Sheet and a Flowing Sea*.

CUNNINGHAM, Andrew Browne, 1ST VISCOUNT CUNNINGHAM OF HYNDRHOPE, British admiral: b. Dublin, Ireland, Jan. 7, 1883. During World War II he was commander in chief of British naval forces in the Mediterranean (1939-1942), and in 1943 was made admiral of the fleet and allied naval commander in the Mediterranean theater. From 1943 to 1946 he was first sea lord and chief of the naval staff. His autobiography *A Sailor's Odyssey* was published in 1951.

His brother, ALAN GORDON CUNNINGHAM (b. Dublin, May 1, 1887), a British army officer, commanded the East African forces which liberated Ethiopia (1940), and the newly formed Eighth Army in Libya (1941). As British high commissioner for Palestine and Transjordan (1945-1948), he supervised British evacuation of the area in 1948.

CUNNINGHAM, William, Scottish clergyman and economist: b. Edinburgh, Scotland, Dec. 29, 1849; d. Cambridge, England, June 10, 1919. A pioneer in the study of economic history, he held ecclesiastical posts in the Anglican church and was professor of economics at King's College, London (1891-1897), and lecturer at Harvard University (1899). His publications include *Growth of English Industry and Commerce in Modern Times* (1882) and *Growth of English Industry and Commerce during the Early and Middle Ages* (1890).

CUNNINGHAME GRAHAM, Robert Bontine, Scottish author and politician: b. London, England, May 24, 1852; d. Buenos Aires, Argentina, March 20, 1936. A liberal in the House of Commons (1886) and the first president of the national party of Scotland (1928), he is best known for his travels in Spanish America and North Africa. His writings include *Mograb el Acksa* (1898); *Life of Bernal Diaz de Castillo* (1915); *The Conquest of the River Plate* (1924); and *Portrait of a Dictator* (1933).

CUNNINGHAMIA, kün-ing-häm'i-ä, a genus of evergreen trees of the pine family, Pinaceae, named in honor of James and Allan Cunningham. Belonging to the Taxodium group, it is called by some botanists Taxodiaceae, or the bald cypress family, and is commonly known as the China fir. At least two species are described: *C. lanceolata*, usually about 75 feet tall, but recorded as large as 150 feet in height and 28 feet in girth, is a native of southern and western China; *G. Konishii*, which attains a height of 100 feet and a girth of 20 feet, is a native of Formosa.

CUNO, kōō'nō, Wilhelm, German statesman: b. Suhl, Germany, July 2, 1876; d. Aumühle, near Hamburg, Jan. 3, 1933. President of the Hamburg-American Steamship Line from 1918, he was asked to form a new German cabinet upon the resignation of Chancellor Karl Wirth, and in 1922 became chancellor of Germany. He urged passive resistance against the French occupation of the Ruhr, but, unable to stabilize German currency, resigned the following year. In 1926 he was reappointed president of the shipping firm.

CUORE, kū-ô'rê, a novel by Edmondo de Amicis (q.v.), which relates the school life of a boy in third grade of an Italian elementary school.

CUP, Divination by, a mode of foretelling events, in use among the ancient Egyptians, and still surviving in some of the rural districts of England and Scotland. In the East, one method was to put small pieces of gold, silver and precious stones engraved with mystic characters into a cup of water, then to invoke the infernal powers, who replied by some signs in the cup. By the modern method, a person's fortune is foretold by the disposition of the sediment in his teacup after pouring out the last of the liquid.

CUP-AND-SAUCER LIMPET, shells of the gastropod genera *Calyptrea* and *Crucibulum*, so called from having in the middle of the inside of the shell a cuplike process, the shell proper constituting the saucer. *Hipponyx* is another form. *Crucibulum striatum* occurs off shore on our coast.

CUP SPONGE. The cup sponge of Turkey (*Spongia adriatica*), also called the Levant toilet sponge, is one of the finest sponges brought from the Mediterranean Sea. It is of the branch *Desmospongiae*.

CUPID, kū'pid, in Roman mythology, the god of love, similar to the Greek Eros, the son of Mercury and Venus. He is usually represented as a winged infant, naked, armed with a bow, and a quiver full of arrows. Sometimes he is represented with a helmet, a spear and a buckler, intimating that even Mars himself owns the superiority of love. His power was generally shown by his riding on the back of a lion, or on a dolphin, or breaking to pieces the thunderbolts of Jupiter. He was supposedly capable of all sorts of mischief and is so represented in modern works of art. The *Cupid Frescoes* at Pompeii are among the best examples of this portraiture.

CUPOLA, kū'pô-lâ, in architecture, a hemispherical semi-elliptical roof, built of stone, timber, metal or glass. The ancient cupolas were hemispherical and were used with great effect by the Romans. The greater part of modern cupolas are semi-elliptical, cut through their shortest diameter. Of ancient cupolas, the finest is that of the Rotunda or Pantheon at Rome, erected under Augustus, and still perfect; of modern construction, some of the handsomest are those of Saint Peter's at Rome, of Saint Paul's, London, the Hotel des Invalides, Paris, Santa Maria da Fiori at Florence, Saint Sophia at Constantinople and the national capitol at Washington, D.C. The term is also applied to any small structure rising above the roof, not necessarily spherical, but of any shape. It is distinguished from "dome" in that it may be used either of the interior or exterior structure, generally the former. When the outer roof differs in shape from the inner roof it is proper to call the latter a cupola.

CUPPLES, Samuel, American manufacturer: b. Harrisburg, Pa., Sept. 13, 1831; d. St. Louis, Mo., Jan. 6, 1912. When he was the age of 12 he was employed in a grocery store in Pitts-

burgh, but removed to Cincinnati in 1846, where he entered a woodenware establishment. In 1851 he was sent to Saint Louis to establish a branch house there, which as the house of Samuel Cupples & Company became widely known. In 1883 this was reorganized as the Samuel Cupples Woodware Company, of which its original founder was chosen president. It was the largest business of its kind in the world, its trade equaling in amount that of all other woodenware houses in the United States. He took a warm interest in education and did very much to sustain the school system of Missouri. He was the original promoter of the Saint Louis Manual Training School and his gifts to educational institutions amounted to several million dollars. Cupples Station (q.v.) was one of his most beneficent enterprises for the good of Saint Louis.

CUPPLES STATION, a railway junction in Saint Louis established by Samuel Cupples (q.v.) and others. An extensive system of railroad warehouses has the basements traversed by railroad tracks. Merchants are thus enabled to receive and reship goods with the expense of handling them reduced to a minimum, the expense and delay of cartage being eliminated from the problem. This vast property was presented by Samuel Cupples and his partner, R. S. Brookings, to Washington University, this institution collecting all rentals therefrom.

CUPRITE, kū'prît, native cuprous oxide, Cu₂O. It is the richest of the copper ores and occurs earthy, massive and granular, and also in beautiful isometric crystals which in the variety chalcotrichite are elongated into capillary crystals. Usually it is translucent, of adamantine luster and very dark cochineal-red color. Its hardness is 3.5 to 4 and specific gravity about 6. Among its many important localities are Chessy in France, Cornwall in England, South Australia and Chile and, in the United States, at Bisbee and Morenci in Arizona.

CUR, a dog of any kind not highly valued, and in this way often particularly appropriated to dogs of mongrel breed. Naturalists use the term cur as the common designation of many races, of which the terrier may be considered as the type.

CURA, VILLA, or **VILLA DE CURA**, Venezuela, city situated 50 miles southwest of Caracas and a short distance from Lake Valencia, in the state of Aragua, a part of the old state of Miranda. Wine, silk and sponges are produced. It was founded in 1730 by Juan Bolivar y Villegas. The site of Cura is 1,600 feet above sea level at the foot of a steep hill; an extensive valley, watered by two streams, outspreads before it. A record of its temperature shows as the maximum 87°F.; minimum 72°; mean annual 79°F. Owing to its proximity to the llanos of the Guárico and the surrounding agricultural and grazing districts, with their plantations of sugarcane, coffee, cacao, cotton, indigo, etc., as well as herds of cattle, Cura is a thriving little place. It suffered considerably in the War of Independence. In 1900 it was visited by a destructive earthquake. Pop. (1941 est.) 8,280.

CURAÇAO, kū-râ-sâ'ô, West Indies, largest island of the southern group of the Nether-

lands Antilles (q.v.), 60 miles north of Venezuela, 210 square miles in area. The island, 33 miles long and 6 miles across, is rocky, and reaches its greatest height at Mount San Christoffel, 1,220 feet. Willemstad (pop. 1947, 39,678), capital and chief port, is at the entrance to the Schottegat, a large landlocked bay on the southwest coast. Streams are few and rainfall light, the mean annual rainfall at Willemstad being 22 inches. Curaçao has an even temperature, the mean average annual figure being 81.0°F. Natural vegetation includes such plants resistant to drought as agaves, aloes, and cacti. The peel of bitter green oranges is used to prepare a liqueur named Curaçao (see below). Pods of the divi-divi tree yield a tannin used in the tanning industry. Tropical fruits are grown on irrigated land; and the weaving of Panama hats, made of palmetto leaves imported from Venezuela, has long been a home industry. Cattle, sheep, and goats are raised, and goatskins are exported. Ancient guano deposits yield phosphate of lime used as a fertilizer. The refining of petroleum imported from Venezuela is of prime economic importance to Curaçao; a refinery on the shores of the Schottegat is one of the world's largest. Pop. (1947) 88,323. For history, see NETHERLANDS ANTILLES.

CURAÇAO, or **CURAÇOA**. The genuine Dutch liqueur of this name, so much esteemed for its taste and aroma, is prepared from a peculiar kind of bitter oranges growing in Curaçao, which fall from the tree before they are ripe, and which have an extremely persistent aromatic odor and taste. The rind of the orange is macerated, the white pulpy matter scraped off, and the yellow part, along with yellow fresh oranges, steeped in strong alcohol for 24 hours. The liquor is distilled and rectified, and then mixed with a syrup made of fine white sugar. To this is added a certain quantity of curaçao infusion, which is a stronger alcoholic extract of the peel containing sugar, and then a certain proportion of water. The fluid is clarified and allowed to settle. The finest quality has a deep yellow color, which is sometimes improved by a few drops of tartaric acid.

CURARE, kû-râ'rê, a complex viscous mixture prepared from poisonous plant juices by certain tribes of South American Indians, and used by them as an arrow poison. The preparation is carried out with ceremonial rites in great secrecy, so that the nature of many ingredients is uncertain. These likewise vary in curare of different types and from different regions, but an essential part seems to be the sap of *Strychnos toxifera*, and probably other *strychnos* species. In 1536, Antonio Pigafetta, at Venice, described the use of poison arrows in Patagonia, and Sir Walter Raleigh also wrote vividly of curare poison in Guiana (1596). Alexander von Humboldt, in 1800, was probably the first white man to witness curare preparation, on the Orinoco. The action of curare was studied by Rudolf Virchow, Berlin, in 1847, but only in very recent times (1935-1940) has progress been made in determining the structure of the active alkaloids. There are three kinds of curare, distinguished by method of packing: para, tube, or bamboo curare is put up in bamboo tubes; pot curare in small brown earthenware pots; calabash, or gourd curare is packed in small gourds. There is considerable difference in the constituents of the three varie-

ties. Tube curare has yielded curine (bebeerine), formula $C_{26}H_{38}N_2O_6$, crystalline, levorotatory, melting point 213°C., and tubocurarine chloride, $C_{26}H_{31}Cl_2N_2O_6 + 5H_2O$, leaflets, dextrorotatory, melting at 275°C. The alkaloids of pot curare are protocurarine, $C_{19}H_{25}NO_3$, protocuridine, $C_{26}H_{38}N_2O_6$, and neoprotocuridine, $C_{26}H_{38}N_2O_6 + 8H_2O$. From gourd curare, calabashcurarine I and calabashcurarine II have been isolated. Most of these alkaloids are of the isoquinoline type. It is not certain which are responsible for the action of curare. Curare is said to be nontoxic when taken by mouth, but is exceedingly poisonous when introduced into the blood stream. It paralyzes the ends of the motor nerves of voluntary muscles, then ascends to nerve trunks, causing death by respiratory paralysis. It is used medically in treatment of hypermotor nervous diseases and in spastic paralysis.

CURASSOW, kû-râs'ô, a large gallinaceous, arboreal bird of the subfamily Cracinae, family Cracidae, which includes the finest game birds of South America. Some species are as large as a turkey (e.g. *Crax globicera*, found in Mexico). They have short wings, long broad tails and strong bills. Unlike most gallinaceous birds, the hind toe is on a level with the others. With the exception of but one species found north of Panama, they are confined to South America, east of the Andes, and south to Paraguay. They live on fruits, nuts, seeds and insects, generally travel in small flocks, and nest in trees. They usually have handsome plumage, the males being black above, glossed with purple or dark green, white below, with large and somewhat curly crested head. In some species the black plumage is beautifully varied with narrow white stripes. Their flesh is white and exceedingly delicate.

CURB, a disease in horses due to strain of the ligament running down the back of the hock, and usually caused by sudden or violent exertion. A swelling appears on the outer and back part of the joint, about five or six inches below the point of the hock, generally causing lameness, most apparent in trotting, and, in slight cases, usually decreases after the animal has been out for 10 minutes. Fomentations should be used to allay the irritation and inflammation, and a high-heeled shoe put on. When heat and tenderness disappear, cold applications will be advisable; after which, the enlargement still continuing, a blister may be necessary. All work must be forbidden.

CURBINA. See DRUMFISH.

CURCULIO, kûr-kû'li-ô, an insect-enemy of the plum.

CURCULIONIDAE, kûr-kû'li-ôn'i-dê, the snout beetles, or weevils (q.v.). One of the most extensive families of coleopterous insects. They belong to the section *Rhynchophora* and all the species have a curious snoutlike head.

CURCUMA, kûr-kû-mâ, a genus of the Marantaceae, the gingerwort and cardamom order. The corm is about as thick as the thumb, and is divided into several parts. The leaves which are about a foot long are lanceolate in form and sheathing. *Curcuma longa* is a turmeric plant, the tuberous rhizomes of which furnish the substance called turmeric (q.v.). This plant is extensively cultivated in

southern Asia. *C. amada*, a native of Bengal, is the mango-ginger, which has qualities resembling ginger. From the colorless rhizomes of *C. leuconhiza* is prepared a kind of arrowroot. *C. zedoaria* yields a tonic medicine, and is also used as a food.

CURD. See **CHEESE**.

CURES, kūr'ēz, an ancient town, Latium, Italy, 25 miles northeast of Rome, near the Tiber, famous as the original home of the Sabines, and the birthplace of Titus Tatius and of Numa Pompilius, whence the Romans, after the people of Cures united with them, came to be called Quirites. The Lombards destroyed the town toward the close of the 6th century. It stood not far from the modern Corresi.

CURFEW, kūr'fū, from Old French *cu-eurefu*, *couvrefeu*; French, *couvre-feu*, literally "cover fire." The term has been traditionally applied both to a regulation requiring inhabitants of a town or village to blanket or extinguish hearth fires and other lights in their houses, and to the bell which sounded the signal for immediate compliance with the regulation. The identification of the regulation with the bell is evident in the opening line of Gray's *Elegy in a Country Churchyard*, "The curfew tolls the knell of parting day," and is implicit in Rosa Hartwell Thorpe's poem, *Curfew Must Not Ring To-night*.

The curfew bell was a common feature of European life in the Middle Ages, especially in wartime. William the Conqueror is credited with having introduced the curfew into England where it became general during his reign; more probably he compelled stricter observance of existing regulations. Monasteries and cathedral chapters had their own curfews. It has been suggested that the ringing of the Angelus bell, prevalent in the 14th century, grew out of the older custom of the curfew. In a more recent epoch the curfew bell was the signal for lighting street lamps.

As a military measure the curfew has a long history extending from medieval times, or earlier, to the present. The regulations prescribed for military curfews are dependent on circumstances. They may involve only the requirement that civilians keep off the streets during specified night hours and with no obligation to extinguish lights. Occupation forces often institute curfews as a security measure.

In the United States before the Civil War curfew laws existed in many Southern communities requiring slaves to remain off the streets after 9 P.M., unless provided with a pass by their owners.

Curfew ordinances were adopted by villages and municipalities in several Western states, including Nebraska, Missouri and Kansas, in the last decades of the 19th century: they applied specifically to children and were enacted by reason of a great increase of juvenile delinquency and crime. Usually the curfew hour was set for children under 15 years of age at 9 P.M. in summer and 8 P.M. in winter. At the beginning of the 20th century it was estimated that over 3,000 cities and villages in the United States had adopted curfew ordinances.

During succeeding decades the practice of ringing a bell or sounding a siren as a signal for children to return to their homes became less common. After World War II very few Amer-

ican communities retained curfew ordinances. However, it is still customary, especially in villages and small towns, for police officers to question young boys and girls found loitering in the streets late at night. If they are unable to show that they have parental or guardian's permission, they are warned to return immediately to their homes or submit to arrest as vagrants. With increased police protection of communities, this method of coping with the problem of neglected children, at least to the extent of keeping them off the streets at night, appears to have proved as effective as the curfew ordinances.

CURIA, kūr'i-ā, a certain political division of the Roman people, said to have been established by Romulus; also the place of assembly for each of these divisions. According to Livy, Romulus divided Rome into 30 curiae, and assigned to each a separate place of meeting. In early times only the members of the curiae were in possession of the full citizenship of Rome. The curiae were probably territorial divisions, including groups of related families. They had political functions and religious functions of various sorts.

Consult Botsford, G. W., *The Roman Assemblies* (New York 1909).

CURIA REGIS, kūr'i-ā rē'jis, (Lat. "King's Court"), in English history, the name applied at different times to three distinct judicial bodies: (1) the feudal assembly of the tenants in chief, (2) the Privy Council, organized under Henry I, (3) the Court of King's Bench, founded in 1178. The first of these bodies constituted the Magnum Concilium or Great Council of the Realm, and combined the characters of the Saxon *witan* and the Norman feudal court. Its consent was necessary for the imposition of extraordinary taxes and the enactment of new laws; also, the king was supposed to consult its advice on general questions of state policy. In those days no distinction was recognized between the various functions of government—legislative, executive, judicial, financial, ecclesiastic or military; hence all royal measures of national importance were undertaken in the presence and with the consent of the council. In course of time an inner council arose, the nucleus of which was provided in the royal household, and gradually took shape under Henry I as the *Curia Regis proper*. This was the beginning of the House of Lords, and was practically a committee of the parent body, which had grown too unwieldy. While legislative powers remained with the council, the committee supervised legislation generally, and was composed of high court officials appointed by the crown. It comprised what may be regarded as the Privy Council, a bureau of administration, and a high court of justice, and in the course of centuries gave birth to all the administrative institutions of the United Kingdom as each was severed from the parent body and became an independent unit. In the reign of Henry I the *Curia*, presided over by the *Great Justiciar*, began to confine its operations mainly to judicial work, and its members were called justices, who sat in the Court of Exchequer. Every baron (lord) of this court was also a justice of the *Curia*, and from this connection arose the system of judicial circuits. Judicial administration was extended and developed by the *Curia* until it became part of the

regular judicial machinery under Henry II. Up to that time the *Curia* moved with the king from place to place and held its sittings wherever the royal court happened to be located. In 1178, however, a separate committee of five judges was created to be fixed in one spot and determine criminal cases, and is today known as the Court of King's Bench. The separation of the Court of Common Pleas from the *Curia* was effected by Magna Charta (1215). The three bodies were completely separated with a distinct staff of justices for each, under Henry III. Another offshoot from the *Curia Regis* is the Court of Equity; while the Court of Exchequer, formerly the financial committee of the *Curia* under the chancellor, is now part of the Supreme Court of Judicature. On the accession of the Tudors the Privy Council of the *Curia* was organized into the *Star Chamber* (1486), a distinctly illegal court in which the king's ministers sat as judges and conducted trials without juries, inflicting torture, mutilation, imprisonment and fines contrary to law. This unsavory institution, which was abolished in 1641, was the direct ancestor, strange to say, of the modern Cabinet.

CURIA ROMANA, collective name for the executive, administrative, and judiciary organs of the central government of the Roman Catholic Church under the absolute rule of the Roman pontiff. The Curia as it is today consists of eleven congregations or departments, three tribunals and four offices, the most important of which is the Secretariat of State. The bureaucratic personnel (*curiales*) is made up of cardinals, prelates and minor officers usually all members of the clergy. (For the attributions and regulations of each of these organs of the ecclesiastical government see CANON LAW.)

From the early centuries the bishop of Rome (the See of Peter) enjoyed a unique prestige in the whole church. The primacy of the Roman See, though in a vague and indefinite form, was generally recognized. From the 4th century on, during the periods of great theological controversies and of endless conflicts within the ecclesiastical hierarchy, no essential decisions on both doctrinal and disciplinary matters were made without the intervention of the bishop of Rome. In the ancient church, and for many centuries afterward, the papacy usually did not interfere directly in the ordinary administration of other churches, but its authority to receive appeals and to settle disputed elections or depositions of bishops (Council of Sardis), as well as to send to the general councils legates who held a prominent position at them, and to ratify their decisions, were sanctioned even by the civil authority (Imperial rescripts of Gratian, 378, and Valentinian III, 445).

In the 11th century a great change took place in the organization of the old Roman Presbyterium and a central ecclesiastical government of the whole church began to take shape. By the Bull of Pope Nicholas II (1059) the right to elect the pope was restricted to the Roman cardinals excluding the rest of the Roman clergy and of course the people, as well as any direct interference from the emperor or any other secular power. The College of Cardinals as a distinct body forming the high Senate of the church became now the main organ of the ecclesiastical government. The title Cardinal was reserved ex-

clusively to them. No longer a mere honorary title, it was now a high office implying new duties and responsibilities.

Another far-reaching innovation took place in recruiting the personnel of the College of Cardinals as well as of the Roman bureaucracy. The reforming popes, not finding among the Roman clergy enough suitable individuals whom they could trust to carry on their policies, called to Rome eminent ecclesiastics, especially monks from Italy, France, and Germany, made them cardinal bishops or cardinal priests, or deacons and entrusted to them the most important affairs of the papal administration and government. Other non-Romans were called also to hold offices in the papal household and in the Curia. By this measure the native Roman clergy lost the monopoly of offices of papal administration, and the Curia began to assume an international character. The old system of convoking synods of the whole Roman clergy for consultation and decisions in general ecclesiastical affairs was gradually superseded by the *Consistoria*, that is, regular consultations of the cardinals.

Papal courts of justice with permanent judges having ordinary jurisdiction were regularly organized in the 13th century. Pope Gregory IX (1227-1241) established the *Supreme Tribunal of the Inquisition* with powers to arrest, prosecute, and sentence heretics in the whole church. As for contentious and criminal cases submitted either directly or on appeal from episcopal courts to the Holy See, the pope appointed for each case one or more "auditores" to whom was delegated the authority to examine and try the case according to judicial procedure and then submit their conclusions and sentences to the pope for ratification. The Avignon Pope John XXII (1316-1334) made of the *auditores* a permanent college of ten or more judges having ordinary jurisdiction as a court of appeal. This court which held so much power throughout the Middle Ages came to be called *Sacra Rota* (sacred wheel) because its judges served by a special system of rotation. The judges of the Rota are usually chosen among the clergy of various nationalities.

Pope Sixtus V (1585-1590) reorganized the Curia by introducing the modern system of the congregations. Some of his predecessors already had formed special committees of cardinals and prelates and special offices to deal with specific affairs, but most ecclesiastical and political matters were still discussed and decided at the consistorial meetings. The difficulty of obtaining unanimous decisions by that body, the resistance, often stubborn, to accept the views of the pope, and the long delays caused by the consistorial procedure led Sixtus to decentralize the organization of the Curia and to form 15 permanent committees or congregations each having special attributions, a cardinal prefect and three or four other cardinals as members, an executive secretary, and minor officials. Their decisions had to be submitted to the approval of the pope. With this innovation the ecclesiastical government of Rome assumed a more regular form, securing not only a speedy method of conducting all affairs, but also a continuity of procedure.

At the same time, however, Pope Sixtus regularized and extended the peculiar system by which a large number of the lucrative offices of the Curia known as *vacabili*, were sold at auction to the highest qualified bidder. Some of them brought high prices: Lorenzo Corsini (later

Pope Clement XII, 1730-1740) paid the equivalent of \$30,000 for the office of regent of the Papal Chancery. To avoid incurring the penalties on simony it was stated that it was not the office that was sold but the income which it brought to the incumbent. The *vacabili* were abolished in modern times by Pope Leo XIII.

Pope Sixtus also fixed the number of cardinals at 70. About one third of them are resident in Curia, holding the offices reserved to them, the others are resident bishops of churches in the various countries. The office of Cardinal Secretary of State superseded the cardinal nephew at the end of the 17th century. The organization of the Roman Curia has remained essentially as planned by Sixtus, although the number of congregations and offices has been changed several times, there have been shifts in their attributions and some offices have been abolished while new ones have been set up. The last reform by Pius X which reduced the congregations to 11, the tribunals to three and the offices to four, assigning to each definite headquarters, greatly simplified the whole system, eliminating duplications and some relics of old abusive practices.

Bibliography.—Ojetti, B., *De Romana Curia* (Rome 1910); Cappello, F. M., *De Curia Romana* (Rome 1911); Ayrinhac, H. A., *Constitution of the Church* (New York 1925); Cicognani, A. G., *Canon Law* (Philadelphia 1934).

CURICÓ, kōō-rê-kō', a province of central Chile, lying between the provinces of Colchagua and Talca, and extending from the Pacific to the Argentine frontier. The eastern and western sections are mountainous, while through the center runs the fertile valley of central Chile. Cattle, wheat, and wine are its principal products, and copper, silver, gold, and salt its important industries. Area (1940) 2,215 square miles; pop. (1943) 90,490. The capital of the province is Curicó, an agricultural center on the Mataquito River, 748 feet above sea level, 116 miles south of Santiago on the main railroad line. Founded in 1742, the city has a large cattle market; flour milling and alcohol distilling are local industries. Pop. (1943) 21,153.

CURIE, kü-rê', **Pierre and Marie**; the former, a French chemist; the latter, a Polish-French physical chemist. Pierre Curie was born in Paris, May 15, 1859; he was run over by a dray in Paris and killed instantly, April 19, 1906. Educated at the Sorbonne, he was named *chef de travaux de physique* at the École municipale de physique et de chimie industrielles, Paris, in 1882. He received his doctorate in 1895 and became professor of general physics at the École de physique et de chimie the same year. In 1904 he was appointed professor of general physics at the Sorbonne and the next year was elected a member of the Academy of Sciences. Pierre Curie's earliest researches were concerned with the magnetic properties of crystals. He discovered a relation for electric susceptibility, known as Curie's law; the abrupt disappearance of ferromagnetism at a critical temperature, known as the Curie point; and with his brother, Paul-Jean Curie, the piezoelectricity of crystals in 1880.

His wife, **MARIE SKŁODOWSKA**, was born in Warsaw, Poland, Nov. 7, 1867; she died at Valence, France, July 4, 1934. After graduating from the Warsaw Lycée at the age of 16, she worked for a time in the physical laboratory of

the Industrial Museum of Warsaw. Becoming involved in a students' revolutionary organization, she found it advisable to leave Warsaw, and went first to Krakow and then to Paris, where, in 1891, she began her studies at the Sorbonne. There she met Pierre Curie, and they were married in 1895. In 1900 she became instructor in physics at the École normale supérieure des jeunes filles, at Sèvres.

Becoming interested in radioactivity, discovered in uranium salts by Antoine Henri Becquerel (1896), Curie and his wife showed that thorium minerals were also radioactive. In July 1898, they discovered the new radioactive element, polonium; and in December of the same year, together with G. Bémont, they first discovered radium. They were able to isolate the salts of both these elements from pitchblende by many laborious operations. For these discoveries, the Curies shared the Nobel Prize in physics with Becquerel in 1903.

After the death of her husband, Mme. Curie succeeded him as professor of general physics at the Sorbonne in 1906. She continued research on radium and was able to prepare the metal for the first time; she also determined its atomic weight and other physical properties. In 1911, she received the Nobel Prize in chemistry for this work in isolating radium from its chloride being the only person so honored twice. The curie, a unit of activity for radioactive materials, is named after her. In later life, as director of the Laboratory Curie of the Radium Institute of the University of Paris, she became interested in radium therapy for the treatment of disease. She visited the United States in 1921 and in 1929, both times receiving gifts to purchase radium for therapeutic uses.

CURIE-JOLIOT, Irène. See JOLIOT, FRÉDÉRIC and JOLIOT-CURIE, IRÈNE.

CURIO, Gaius Scribonius, Roman politician and soldier: d. 53 B.C. He was tribune (90), served with Sulla's army in Greece; consul (76); governor of Macedonia (75-73), where he defeated the Dardanians and penetrated as far as the Danube River; and pontifex maximus (57). His son, **GAIUS SCRIBONIUS**, supported Caesar in the Civil War, and was slain in battle against Juba I, king of Numidia, in Africa in 49 B.C.

CURIO (abbr. of *curiosity*), term still popularly used, though somewhat obsolete, to describe any kind of object of curiosity, especially such as would belong to cabinet collections, on account of antiquity, rarity or intrinsic interest.

CURITIBA, kōō-rê-tê-bá (formerly **CURITYBA**) city, Brazil, the capital of the State of Paraná, situated on a plateau 3,120 feet above sea level. It is about 65 miles west of the port of Paranaguá by railroad. Founded in 1654, the city is the commercial center of an area which produces timber, coffee, maté, bananas, and sugar. Pop. (1940 est.) 101,204.

CURLEW, kër'lū, shore birds of the genus *Numenius*, belonging to the snipe family Charadriidae. In this genus the bill is long, slender and accurate, and the toes are rather short, thick and margined. Most of the species are of large size for the family and about 15 are found throughout the world.

The long-billed curlew, *Numenius americanus*, is the largest species (20-26 inches long), with a long, down-curved bill, five to seven inches long. It is brown-buff, without contrasting head stripes, and is seen on the Texas coast, the Great Plains and Great Basin, and on the Pacific coast, but only rarely on the Atlantic coast.

The Hudsonian curlew, *N. phaeopus hudsonicus*, is about half the bulk of the long-billed curlew (15-18 inches long), with a similar but shorter bill. It appears a uniform grayish brown, and has distinct dark stripes on its crown. It breeds in the Arctic, migrates along the coasts, and winters in southern North America and South America.

Two similar European species are distinguished by their white rumps: the curlew, *N. arquata*, otherwise resembling the American long-billed curlew; and the whimbrel, *N. phaeopus phaeopus*, resembling the Hudsonian curlew.

CURLEY, kûr'li, Michael Joseph, American Roman Catholic prelate: b. Golden Island, Athlone, Ireland, Oct. 12, 1879; d. Baltimore, Md., May 16, 1947. He was educated at the Royal University of Ireland and at Rome, and in 1904 he was ordained a priest. He went to the United States in the same year and served as a missionary in Florida until 1914, when he became bishop of St. Augustine. In 1921 he became archbishop of Baltimore; from 1939 he was archbishop of Baltimore and Washington. A vigorous leader in Catholic causes, Archbishop Curley was especially interested in education.

CURLING, kûr'ling, town, Newfoundland, Canada. It is on the west coast of the island, on the Humber River estuary, three miles west of Corner Brook. Curling is a lumbering and fishing center served by the Canadian National Railway. Pop. (1951) 3,537.

CURLING, kûr'ling, a game played on an ice rink between two teams of four men each, using circular stones, two for each player. The rink is a level sheet of ice at least 48 yards long and 14 feet wide. At each end, four concentric circles, with radii of five inches, and two, four, and six feet respectively, are drawn from a center called a *tee*. These circles form the *house*. Four yards behind each tee is placed the foot-hold from which the players deliver the stones. This may be a *hack*, a hole in the ice, or a *crampet*, a metal plate. The distance from one hack to the farther tee is 42 yards. A *hog line* is drawn seven yards in front of each tee.

The stones, which are equipped with handles, are matched for weight and size, and may not weigh more than 44 pounds nor be more than 36 inches in circumference, with a height not less than one eighth the circumference. One side is designed for "keen" ice, the other for slow ice, and the handles may be attached to either side. In parts of eastern Canada, the game has been played with "irons" instead of stones, but the return to the "granite" game is rapidly gaining favor and irons are practically a thing of the past.

The players are known as leads, seconds, thirds, and skips, the skip directing the play of his team, or *rink*. Each player delivers a stone alternately with his ranking opponent, somewhat in the manner of a bowling ball. The game is to slide a stone from one hack to the farther house, having it come to rest as close to the tee

as possible; to strike out the stones of the opposing rink; or to nudge the stones of one's rink closer to the tee or to place guard stones to protect them. Each player carries a broom to clean the ice in front of a running stone.

A stone failing to cross the hog line is removed from play. At the end of each *head*, one point is counted for each stone of a team nearer the tee than any stone of the opposing team. Stones resting outside the house are not counted.

First played on the natural ice of ponds, curling originally was limited to cold weather and daylight hours. This led to the building of thin, level sheets of ice on an asphalt base, and eventually to the closed, artificially lighted rink, although still with natural ice. The development of ice-freezing machines has to a large extent eliminated this last handicap and many rinks now have a curling season of six months.

The birthplace of curling is unknown; some assign its origin to the Flemings, others to Scotland. There is, however, no doubt the Scots are responsible for the development and spread of the game through many countries. It is known to have been played in Scotland early in the 16th century, and old "kuting stones" or "loofies" are preserved in Scottish museums, one being dated 1510. Waterworn boulders with holes for thumb and finger grips were the first stones. Later, handles were placed in them. The early stones were light, but with handles, heavier ones were used, even over 100 pounds. About 1750, circular stones were produced and these soon superseded the boulder type.

On Nov. 15, 1838, the constitution of the Grand (now Royal) Caledonian Curling Club was adopted in Scotland and this has been the mother club to which most of the curling fraternity of the world is affiliated.

Canada was one of the early followers of the game, and while it is not definitely known when the first game was played, there is little doubt that the early Scottish settlers were curling toward the close of the 18th century, although the first club, the Royal Montreal, was not formed until 1807. Since then the game has made great strides and a goodly number of clubs have already celebrated their centenary of continuous play.

The first Canadian branch of the Royal Caledonian Curling Club was established on July 25, 1852, and similar branches were formed later in various parts of Canada. The Dominion Curling Association was formed in 1935 and affiliated with the mother club. At that time the various associations coming under this body had an accredited membership of 22,604. This figure has been increasing at the rate of nearly 5,000 new members a year, showing the rapid growth of curling in Canada.

The curling event with the greatest public appeal is the annual play for the Macdonald Briar Tankard, in which 11 teams, two from Ontario and one from each of the other provinces, take part. The game has become very popular among women and they have many active clubs. It also has enthusiastic followers among high school boys, and a flourishing association with an annual nationwide bonspiel (matches between curling clubs), is making the game an all-age sport rather than the "old man's game" it was once considered.

Wherever Scots have gone they have taken their national pastime with them and the game is now well established in the northern United

States, many European countries, in New Zealand, Australia, and elsewhere.

L. HEBER COLE,
Department of Mines and Resources, Ottawa.

CURLY GRASS, a low, grasslike fern, *Schizaea pusilla*, of the curly grass family, Schizaeaceae, occurring rarely in Ontario, Newfoundland, Nova Scotia, and the pine barrens of New Jersey. It is found in open, damp, peaty or sandy depressions, sphagnum bogs, and low, mossy, open woods, or even in the crevices of ledgy shores and lowlands. This and the Hartford fern, *Lygodium palmatum*, a climbing species, are the only northern American representatives of a family characteristic of the tropics and the Southern Hemisphere.

ARTHUR H. GRAVES.

CURRAN, kŭr'ān, John Philpot, Irish orator and judge: b. Newmarket, County Cork, Ireland, July 24, 1750; d. London, England, Oct. 14, 1817. He was educated at Trinity College, Dublin, after which he went to London and entered at the Middle Temple. He was called to the Irish bar at the Michaelmas term in 1775. Though a Protestant, he espoused the cause of the disenfranchised Roman Catholics. He gained his first notable popular success at the Cork summer assizes in 1780. A priest had been brutally assaulted by Lord Doneraile, but with religious feeling running so high no counsel dared take the victim's case until Curran volunteered. He conducted it brilliantly and won a verdict of 30 guineas for his client. A sequel was the first of five duels fought during the succeeding decade; his opponent, Lord Doneraile's relative, a Captain St. Leger, missed and Curran did not return the fire. In 1782 he became a king's counsel, and the next year entered the Irish House of Commons where he supported his friend Grattan. The first of the great state trials which earned him his forensic fame was that in which he defended A. Hamilton Rowan, secretary of the Dublin Society of United Irishmen, prosecuted on Jan. 29, 1794 for having a year and a half before in a published address urged the volunteers of Ireland to resume their arms. Curran's defense was a masterpiece of eloquence and Irish patriotism which endeared him to the populace. How much Curran knew of the plans for the insurrection of 1798 is not known. After its suppression he defended the prisoners in almost every case, though threatened with deprivation of his rank of K.C. Refusing to be intimidated, he appeared for Wolfe Tone and Napper Tandy. Elected to the Irish House of Commons in 1800, he continued his opposition to the Union. Robert Emmet was devoted to his younger daughter Sarah; after his abortive insurrection of July 1803 he lingered about Curran's house, the Priory (near Dublin) to bid her farewell, thus losing his chance of escape. When the Whigs came to power in 1806, after Pitt's death, Curran was made master of the rolls. In 1814 he retired on a pension of £2,700, traveled on the Continent and spent his last year in London.

Consult Davis, T. O., *Speeches of the Right Honourable John Philpot Curran with a Memoir* (Dublin 1843); Phillips, C., *Curran and His Contemporaries*, 8v., 5th ed. (Edinburgh 1857).

CURRENT, originally a name applied to the

small black raisins of commerce popularly used in cookery, and imported from Greece where they first became commercially important, now raised in California as the Black Corinth (Zante Currant) grape. Now the term currant is applied horticulturally to plants of various species of the genus *Ribes* which are entirely unrelated to the grape (genus *Vitis*).

The most widely cultivated varieties are the red and white currants of the species *Ribes rubrum*, *R. sativum*, and *R. petraeum*. More extensively in England are the black currants (7,500 acres in 1944) derived from *R. nigrum* and highly prized for jam, preserves, and for flavoring. These are much higher in vitamin C than most fruits. Because the black currants are an alternate host of the blister rust, a destructive disease of the white pine, and are the chief agents in the rapid spread of this disease, their planting has been prohibited or discouraged in the United States. Recently black varieties have been originated by the Canadian Dominion government that are immune to this disease. The red and white currants are native in cool northern climates and thrive from New Jersey to Iowa and northward, and in western Oregon and Washington. They are prized chiefly for jelly and preserves. In recent years their use has greatly declined and less than a thousand acres are under cultivation in the United States. The Red Lake, Wilder, and Perfection are the chief red varieties. The Viking, though smaller fruited, is being grown because it is immune to the blister rust disease. The White Imperial is a leading white variety. The plants are propagated by hardwood cuttings. They are set in late fall or early spring, 5 by 8 feet. Heavy soils are preferred sites. Planting should be profitable for ten or more years. The fruit matures at about the same time as early raspberries. Anthracnose and leaf spot diseases are controlled by spraying with bordeaux mixture while the currant worm is controlled by using DDT or other insecticides.

Consult Darrow, G. M., *Currants and Gooseberries*, U.S. Dept. of Agriculture Farmers' Bulletin 1398, id., *Improvement of Currants and Gooseberries*, U.S. Dept. of Agriculture 1937 Year Book (Separate No. 1593), Shoemaker, J. S., *Small Fruit Culture* (Philadelphia 1948).

CURRENCY, a term used to designate the paper component of the medium of exchange. In the past, some economic writers stretched the term to include all of the forms of money which circulate but modern usage limits it, so it may be considered as synonymous with *paper money*.

Currency has as its dominant characteristic the element of credit. It may be defined as a record of an obligation to pay, made in a form suitable for monetary purposes. It may be the obligation of a government, of a privately owned central bank, of a commercial bank, or, in some undeveloped countries, of a private business organization, or even a private person. In all of the more developed countries, however, currency issue is an extremely important function of government which is either exercised directly or delegated as a monopoly to a bank of issue (usually the central bank); and, counterfeiting or any other interference with the official currency is punished under laws designed to protect the integrity of the issue.

Currency is always expressed in terms of the monetary unit of the country in which it is issued. In short, it is a freely circulating promise to pay

the bearer on demand the indicated number of monetary units. The denominations issued are determined by the price level, that is, they must be suitable for use as hand-to-hand money or trade will be seriously impeded and citizens inconvenienced. (A curious example of seeming government disregard of public convenience is the persistent issue of the \$2.00 note in the United States although public antipathy to this denomination is so great that even a superstition that it will bring bad luck has become widespread.)

A circulating medium of exchange is so indispensable in the modern economy with its great division of labor that currency (paper money without intrinsic value) will circulate even though the credit standing of the issuer leaves much to be desired. So long as the evil of over-issue is avoided, the monetary usage will give the currency value and it will be freely accepted unless, of course, there are more attractive alternatives such as gold bullion or coins; but modern nations, with one or two minor exceptions, have long since removed such alternatives, so their citizens are forced to accept their currency regardless of its ultimate quality. Because of this, monetary use now gives currency its value more than ever before; in fact, convertibility, ultimate redemption and the other devices formerly employed for this purpose have been largely abandoned.

Currency issues in the past have tended to be either "too much" or "too little," but in most cases, too much. In either case, prices and business activity were affected. The modern "controlled currency" systems attempt to avoid such impacts on economic activity, or to fit them to government policy or expediency by "controlling" the amount of currency issued. At best, the aim is to fit the quantity of currency to the actual, rather than the fancied, needs of the economy; at worst, currency "management" becomes a dishonest and dangerous political weapon.

Obviously, certain flexibility in the currency supply is desirable and necessary; but every effort should be made to keep control of such changes out of the hands of politicians. In the United States money management is achieved through central bank and money market policies and the quantity of currency is completely in the control of the public as bank deposits can be converted into currency, or vice versa, at the will of bank depositors.

Legal tender, or debt extinguishing power conferred by law, is one of the devices used to make different varieties of currency equally desirable. In the United States, all domestic currency is full legal tender for all debts, public or private. In addition, the secretary of the treasury is specifically charged in the law with the responsibility of maintaining parity of all varieties of our currency, in the following words: "gold certificates owned by the Federal Reserve banks shall be redeemed at such times and in such amounts as, in the judgment of the Secretary of the Treasury, are necessary to maintain the equal purchasing power of every kind of currency of the United States."

GOVERNMENT CURRENCY

Government currency consists of non-interest-bearing notes issued by the government in denominations suitable for monetary purposes and payable to bearer on demand. They may be *convertible*, that is, redeemable in commodity money,

(usually gold or silver coin or bullion); but generally they are *inconvertible*, that is, not so redeemable. Even when convertibility is specifically promised, experience shows that it cannot always be relied on in time of need. This is so because as a practical matter, any substantial effort to convert is met with refusal on the grounds of emergency, national interest, etc., as was the case in the United States in 1933.

Inconvertible credit currency, however, it should be noted, unquestionably carries the obligation of the government for redemption; but the time of redemption is left for future determination. Such currency is thus for all practical purposes on a *fiat* basis; this means, it depends on government "say-so" and public acceptance for its value and usage. Its proponents correctly maintain that it is more economical than commodity-backed currency since, obviously, it is less expensive to produce than silver, gold, etc. They, also, properly point to the great flexibility of paper money. Nonetheless the uniformly disastrous experiences—sooner or later—of over-issue in the countries using fiat currency in the past pointedly demonstrate the dangerous character of such issues. The clear lesson of history is: *there is no more dangerous economic device than government paper "money"*! It is possible, of course, that those responsible for modern money management, as its advocates maintain, may have enough ability and character to avoid this great pitfall of the past but that seems doubtful.

Convertible government currency, or *representative money*, may simply be a negotiable "warehouse receipt" showing the deposit of a specific quantity of a commodity as was the gold *certificate* ("yellow-back") in the United States prior to 1933; and, as was the silver *certificate* then, and since. Or, it may be merely the *promise* of the government to redeem in specie or coin upon demand. Or, it may be the promise of the government to convert the currency upon demand at a stipulated rate into a draft drawn on another country and payable in the gold-backed currency of that country. But, whatever the promise, it is impossible for all holders to go on a gold basis, or silver basis or whatever the convertible option may be, at the same time. In fact, convertibility is always designed to prevent that very contingency! So, in the final analysis, currency, or paper money, is in a sense largely a "fiat" money as it rests primarily upon faith in the character and integrity of the issuer regardless of "the letter of the bond"!

The United States notes, originally issued to help finance the Civil War and commonly called "greenbacks," are an example of an inconvertible currency issue, which later achieved parity and general acceptance through the protection of a special gold reserve held in the Treasury. Some \$347,000,000 of these "greenbacks" are still outstanding and against them and approximately \$1,000,000 of Treasury notes of 1890, a reserve of \$156,039,431 in gold bullion is maintained in the United States Treasury.

BANK CURRENCY

Bank currency, or bank notes, may be issued by privately owned commercial banks or by central banks which are either privately or governmentally owned.

When issued by privately owned banks, various devices such as special safety funds in cash or securities, first lien on all the assets of the

bank, or the requirement that they be backed by deposit of government bonds or other high-grade obligations have been used in attempts to safeguard the quality of the currency. Security through the deposit of government bonds with an independent agency was one of the most popular methods of protecting the note holder. Unfortunately, such a bond-secured currency because of its inelasticity frequently operated to protect the note holder at the expense of the total economy.

The Panic of 1907, with its widespread bank failures, its suspension of specie payment, and its actual shortage of currency offers a particularly striking demonstration of the economic dangers of an inelastic currency. As a result of the 1907 experience, a relief bill, the Aldrich-Vreeland Act of May 30, 1908 which authorized the issuance of emergency currency by groups of banks organized as "national currency associations," was passed by the Congress. None of this emergency currency was issued until the financial disorganization flowing from World War I necessitated the issuance of \$1,121,000,000 of such notes in 1914. These were later replaced by currency issued by the Federal Reserve System, which began to function in November 1914.

The national bank notes in the United States offer a splendid object lesson of the shortcomings of a bond-secured currency. These notes were inversely elastic because it was to the interest of the banks to sell bonds and retire their notes in anticipation of increased business activity which would cause bond prices to decline; in other words, they would sell bonds and retire notes at the very time when business needed more currency. Conversely, it was to the interest of the banks to buy bonds and force notes into circulation when business had no need for additional currency. As all of the government bonds carrying the currency issue privilege have been retired, it is no longer possible to issue national bank notes. The few which remain in circulation are the liability of the government, as the banks deposited other currency with the redemption office when the currency-issue bonds were retired.

CURRENCY IN CANADA

Prior to the organization of the Bank of Canada in 1934, Canadian currency was issued by the chartered banks and the Treasury. The banks could issue up to \$120,000,000 against a reserve of 25 per cent in gold plus \$26,000,000 against the security of specified railway securities guaranteed by the Canadian government. Under the Finance Act of 1914, Dominion notes could be issued in an unlimited amount by the Treasury to the chartered banks, and the savings banks in the Province of Quebec, as advances against the deposit of securities specified in the act. In addition, the issuance of an unlimited amount of currency was permitted against a reserve of 100 per cent in gold. Although the bank notes were not legal tender, they were redeemable in Dominion notes on demand and thus circulated at par throughout Canada.

The Bank of Canada Act in 1934 rescinded the power of the Treasury to issue notes and progressively limited the power of the chartered banks to issue them. Later, the Bank Act of 1944 provided that after Jan. 1, 1945 the chartered banks could not issue or reissue their own notes for circulation in Canada; and that after Jan. 1, 1950, all liability for outstanding notes

would be transferred to the Bank of Canada by payment of a like amount by the chartered banks. As the responsibility for the Dominion notes had been transferred to the Bank of Canada upon its opening, it thus became the sole source of Canadian currency issue.

CURRENCY IN THE UNITED STATES

The currency system of the United States has been greatly simplified in recent years. Beginning with the withdrawal of the gold certificates from circulation in 1933, continuing with the elimination of the national bank notes through the expedient of redeeming the government bonds bearing the circulation privilege in 1935, and culminating with the repeal of the power of the Reserve banks to issue Federal Reserve Bank notes in June 1945, great progress was made in the direction of making Federal Reserve notes the sole currency medium.

In addition to the national bank notes and the Federal Reserve Bank notes, the Treasury notes of 1890 were also retired. This left only the *silver certificates* and the *greenbacks* as possibilities for further simplification. In view, however, of the powerful pressure group which rushes to the defense of silver at the slightest provocation and the sentimental and inflation support accorded the "greenbacks" it is doubtful that either can be eliminated—certainly not the silver certificates in the foreseeable future!

Federal Reserve Currency.—In the words of the official statement in the Federal Reserve Bulletin, "Federal Reserve notes are obligations of the United States and a first lien on all the assets of the issuing Federal Reserve Bank. Federal Reserve notes are secured by the deposit with Federal Reserve agents of a like amount of gold certificates or of gold certificates and such discounted or purchased paper as is eligible under the terms of the Federal Reserve Act, or of direct obligations of the United States. Federal Reserve Banks must maintain a reserve in gold certificates of at least 25 per cent, including the redemption fund, which must be deposited with the Treasurer of the United States, against Federal Reserve notes in actual circulation; gold certificates pledged as collateral may be counted as reserves. Gold certificates as herein used includes credits with the Treasurer of the United States payable in gold certificates."

As the foregoing indicates, there could be no question about the safety of our Federal Reserve notes. There was, however, considerable question about their flexibility, that is, whether their total contracted and expanded in accordance with the demonstrated needs of business. The original concept of the Federal Reserve Act was that the volume of currency would be more or less automatically controlled by the basic requirement that only eligible paper could be rediscounted, i.e., paper arising out of the production, distribution, exportation or importation of goods. But two world wars and the Great Depression of the 1930's forced the system to subordinate this early concept to the solution of more emergent problems with the result that eligible paper dropped to a minuscule proportion of Federal Reserve assets. Federal Reserve notes, in consequence, were backed by gold certificates (non-negotiable and exchangeable for gold only by the Federal Reserve banks and only on a permissive basis) and by government bonds. The Federal Reserve System, which was designed to emanci-

pate the country from the proved evils of a bond secured currency thus came full circle and the problem once more troubled the country.

Hoarding of Currency.—Higher prices, higher taxes and the black markets of World War II caused a great increase in currency in circulation, particularly the larger denominations. From 1941 to 1946, \$1 notes in circulation increased only 48 per cent, whereas \$20 notes increased 266 per cent, and \$100 notes increased 233 per cent. Total circulation (including about 5 per cent in coin) increased from \$11,160,000,000 in 1941 to \$27,048,000,000 in January 1951, an increase of 142 per cent and an increase of 390 per cent over the \$5,519,000,000 of 1933.

Although higher prices and increased business activity were responsible for a large part of this huge total, analysis of the increase by denominations of bills issued clearly indicates that a greatly increased volume of currency and substantial hoarding had become characteristic of our currency system. When it is recalled that \$4,700,000,000 of money in circulation was adequate to support the boom of 1929, a better idea of the extent of the problem emerges. Unfortunately, the causes promise to get worse rather than better, so there is little prospect of betterment in the foreseeable future. In any event, the problem was still a serious one in the 1950's. See also COINAGE; FEDERAL RESERVE SYSTEM; LEGAL TENDER; MONEY.

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RAYMOND RODGERS,
Professor of Banking, Graduate School of Business Administration, New York University.

CURRENCY BILL of 1900 (February 15), which became law March 14, was the culmination of the many years' struggle between United States parties over the standard of value; ending in the complete victory of the gold party, 46 to 29 in the Senate on the adoption of the bill. The provisions are: The unit of value to be the gold dollar of 25.8 grains, nine tenths fine; all United States money to be maintained at a parity with it and all government paper money to be redeemable in gold. A redemption fund of \$150,000,000 to be set apart not to fall below \$100,000,000, and if necessary replenished by sale of bonds at not over 3 per cent. As fast as silver dollars are coined, an equal amount of treasury notes to be replaced by silver certificates; gold certificates on certain conditions to be issued against the gold in the Treasury. No United States or treasury notes to be of less than \$10, nor silver certificates of more than \$10. The bonded debt may be refunded in 30-year 2 per cent gold bonds, at not less than par. Up to March 1935 national banks could issue circulating notes up to their paid up capital by depositing United States bonds.

CURRENT, a flow or stream of a body of water, more or less rapid, by which vessels are compelled to alter or modify their course or velocity, or both, according to the set or drift of the current. Rivers have currents varying in strength, chiefly according to the inclination of the bed down which they flow.

The technical language in which the flow of water and its channels are known and described is as follows: The bed is the watercourse, hav-

ing a bottom and two sides or shores. When the latter are described as right- or left-hand, going downstream is assumed. The transverse section is a vertical plane at right angles to the course of the current. The perimeter is the length of this section in the bed. The longitudinal section or profile is a curve whose abscissa is proportional to the distance up or downstream from a given point and whose ordinate is proportional to the depth. The slope or declivity is the mean angle of inclination of the surface of the water to the horizon. The fall is the difference in the height at any two points of determinate distance apart, as, for instance, eight inches to the mile. The line of current is the direction of maximum velocity. The mid-channel is the deepest part of the bed. The velocity is greater at the surface than at the bed. The surface is higher in the current than at the shore when the river is rising, lower than at shore when the river is falling. The direction is the set of the current; the rate is the drift of the current. For electric current, see ELECTRICITY. See also OCEAN CURRENTS.

CURRENT EFFICIENCY. See FARADAY'S LAWS.

CURRENT METER, an instrument for measuring the velocity of the flow in rivers and streams. The current meter used by the United States Geological Survey consists of two essential parts: (1) a wheel which is so arranged that the flowing water shall turn it steadily, and (2) a device for recording the number of such revolutions. The earlier forms of meters were mounted on floats and measured only the surface velocity. This was soon proved inadequate, and was improved so that measurement at any depth may be made. The current meters in present use are of two distinct types, direct-action meters and differential-action meters, the classification depending on whether in revolving the wheel the water does or does not exert a force which tends to retard the wheel's motion. In the direct-action type the wheel carries vanes (either flat or warped) set on a horizontal axis and revolving by the direct pressure of the moving water against the vanes. In this form of meter the friction increases as the velocity decreases. In the differential meter the wheel is made up of a series of cups at the extremities of short spokes. This wheel revolves on a vertical axis. The pressure of the current of water on the concave side of the cup is greater than on the convex side in the proportion of 100 to 38. The wheel revolves slower than the direct-action wheel and the friction increases with the velocity, but is overcome by the increased motive power developed by the velocity. The current meter is usually equipped with a tail which holds it steady in the current. It may be attached rigidly to rods from an overhead bridge or hung by a cable. In the latter case weights are attached below to hold it in position. In high velocities or deep streams guy wires are attached. The recording mechanism is on the bridge or on shore, connection being made by an electric cable, and the record is made by electricity supplied by a battery. The true relation between the revolutions of the meter wheel and any velocity of a stream must be established individually for each meter before it is used.

This testing is called rating. A current meter is rated by drawing it through still water at a uniform speed and noting the number of revolutions as to time and distance, from which the number of revolutions per second is computed. Many such experimental runs are made with each meter at different speeds and the results are so recorded as to be quickly available in computing current velocities from any record that individual meter may make.

CURRENT RIVER, kûr'ênt, Missouri, rising among the Ozark Mountains in the southern central part of the state flowing southeast and south into the Black River in Arkansas. The length is about 225 miles.

CURRENTS, Ocean. See OCEAN CURRENTS.

CURRICULUM, kûr-rîk'û-lûm. While in a general way the word curriculum is used to describe a systematic group of courses or sequence of subjects required for graduation in a school or college, it is used in many other ways and in combination with various limiting words such as: "child centered curriculum," "social studies curriculum" and the like. The meaning of the term has gradually been broadened to include the total school experience of the pupil or student. Because of the many uses of the term and the many combinations it has with various descriptive words, there is at the present time a considerable confusion surrounding its use. If, for example, one refers to the art curriculum, one has reference to the course of study prescribed for those who are specializing in art. If the term "activity curriculum" is used there is no reference to any specific course of study but instead to a general pattern of organization for a school, one which might be applied in a variety of subjects and under different conditions.

As concepts of learning have altered and as changes have taken place in the psychology of the learning process the word curriculum has thus taken on new meanings. Studies of the learning process indicate that not only the specific subjects studied by pupils but the entire life of the school influences their character and even their specific subject matter development. It is, therefore, confusing to separate the specific materials studied by pupils from the methods by which they are taught and from the attitudes of teachers and the human relationships which prevail in the classroom. Thus a teacher might be skillful in teaching reading, but the relationships between her and her pupils might be such as to frustrate the learning process. Similarly the home environment of the pupils or the conditions of the community may play a large part in the educational program. As a result it has come to be more common to speak of the curriculum as the total learning experience of the pupil including content, method, and the total life of the school. For example, educators who are working on the so-called core curriculum are really developing a total program for the education of the child including not only his school experience but carefully planned home experiences and a full use of community resources.

Research in curriculum has, as a result of the above change in concept, broadened with the passing of the years to include almost everything that relates to the educational growth and devel-

opment of the pupil. At the same time there has been a movement in the direction of individualizing the curriculum for every child. While there are general guide lines for study for all children, it is recognized that no two children are alike and that in a very real sense an individual curriculum must be planned for each pupil. Such planning calls for a high level of skill and understanding on the part of the teacher. This means skill in studying individual children and competence in developing or adapting materials and content to the needs of the individual pupil. The process of adapting educational experiences to the needs of children has not reduced the importance of good scholarship. Rather it has given scholarship a new meaning in that the learnings involved are seen as the results of real thinking, growth, and development on the part of the pupil. Similarly, the role of subject matter becomes that of a means instead of an end in itself. Such a change in role not only does not reduce the importance of subject matter but, if properly handled, may actually enhance its significance. See also EDUCATION, ELEMENTARY; EDUCATION, SECONDARY.

ERNEST O. MELBY,
Dean, School of Education, New York University.

CURRIE, kûr'î, SIR Arthur William, Canadian educator and soldier: b. Napperton, Ontario, Dec. 5, 1875; d. Montreal, Nov. 30, 1933. Educated at Strathroy Collegiate Institute, in 1893 he went to British Columbia, taught school at Sidney, and later entered business in Victoria where he became a partner in a real estate firm. At the outbreak of World War I in 1914 he had attained the rank of lieutenant colonel in the militia, commanding the 5th Canadian Garrison Artillery. He commanded the Vancouver Highland Battalion in the First Canadian contingent, and after the Battle of St. Julien (1915) was promoted brigadier general and given a brigade. A year later, as major general, he commanded the First Canadian Division, and in 1917 succeeded Sir Julian Byng commanding the Canadian Corps, with rank of lieutenant general. After the Armistice, he commanded the Canadian forces on the Rhine. On his return to Canada in 1919 he was appointed inspector general of militia. From 1920 until his death he was principal and vice-chancellor of McGill University. General Currie's inspired leadership and the *elan* of his troops—especially at the second battle of Ypres, St. Julien, Courcellette, Thiepval, and Vimy Ridge—won him many honors and decorations.

CURRIER, kûr'î-êr, Nathaniel, American lithographer: b. Roxbury, Mass., March 27, 1813; d. New York, N. Y., Nov. 20, 1888. His birthplace was not far from Boston where the process of lithographing first took root in America after having been originated by Aloys Senefelder, in Bavaria, late in the 18th century. Young Currier was apprenticed at 15 to William S. and John Pendleton, one of the first American lithographing firms. He learned rapidly and in 1834, when he was only 21, launched his own firm in New York.

The first lithograph published by Currier is believed to have been *Ruins of the Planter's Hotel, New-Orleans, Which Fell at Two O'clock on the Morning of the 15th of May 1835 burying 50 persons, 40 of which escaped with their Lives*. He continued to produce prints without any in-

dication of great success in the field in the years that immediately followed.

In 1840, however, the steamboat *Lexington* burned in Long Island Sound with the loss of a hundred lives. Three days later Currier published a lithograph of the burning ship, the demand for which kept his presses running night and day. Its widespread sales established him nationally.

Currier's news sense coupled with his ability to anticipate public interest kept his firm busy thereafter. In 1857 James Merritt Ives, who had married his wife's sister and had been employed by him as a bookkeeper, became his partner, bringing to the firm a sense of business and a knowledge of art which proved of distinct advantage. The firm of Currier & Ives in the half century that followed turned out thousands of prints which today have become collectors' items. Currier retired in 1880 turning his interests over to his son, Edward West Currier, who continued in partnership with Ives' son, Chauncey, until the turn of the century. The firm ceased to exist in 1907.

RUSSEL CROUSE.

CURRIER & IVES (NATHANIEL CURRIER and JAMES MERRITT IVES, qq.v.) an American firm of lithographers. The business was founded in New York City in 1834 by Currier. Ives joined the firm as a bookkeeper in 1852 shortly after his marriage to Currier's sister-in-law. He became a partner in 1857.

In the last half of the 19th century their stones turned out more than 7,000 individual pictures in quantities mounting into the hundreds of thousands. The two men could sense, apparently by instinct, what the public wanted in the way of inexpensive art. The firm's success began with the reproductions of scenes of national disasters, notably the burning of the steamboat *Lexington* in 1840, which appeared three days after the catastrophe and was sold all over the country.

The list of lithographs eventually embraced a wide range of subjects: land and sea battles, wrecks, fire scenes, clipper ships, whalers, views of cities, scenes of farm life, portraits of celebrities in every age and every field from politics to pugilism, scenes in the wild West, sporting prints including hunting and fishing scenes, horses and horse races, sentimental prints of every maudlin description, historic events, deathbed scenes, campaign banners, and even cartoons. Although, in general, artistic standards were not their achievement or even their goal, Currier and Ives did employ some of the finest artists in the country during the span of their success, notably Fannie Palmer, Louis Maurer, Thomas Worth, Arthur Fitzwilliam Tait, George Henry Durrie, Charles Parsons, and James Butterworth. Currier was himself a lithographer and Ives a highly intelligent, self-educated student of art, who also made a few prints himself.

The lithographs were printed from stones on presses that were hand-operated. They were printed in black and white and colored afterward by a staff of 12 women. The term "chromo" is incorrectly used in connection with most Currier & Ives prints, very few being made by the process of chromolithography, which was not used in America until 1860.

Currier and Ives prints sold for from 15 cents to 25 cents in the small size, 2.8 inches by 4.8

inches, and from \$1.50 to \$3.00 in the "large folio" size, approximately 18 inches by 27 inches. They were sold in their store in lower New York, from pushcarts in the streets, from the counters of country stores, and even by agents in Europe.

Currier retired from the business in 1880, his son, Edward West Currier, succeeding him. Ives carried on until 1895 when he died, leaving his interest to his son Chauncey. The second generation Currier & Ives continued the business for some years, finally selling out to one of their employees who carried on until 1907 when the firm ceased to exist.

Two score years later the prints began to come into another kind of vogue, this time as collectors' items. The comparatively few that remained of the hundreds of thousands that were printed originally took on new importance and value, prices being based on their scarcity. One, *The Life of a Hunter—a Tight Fix*, brought the highest price, \$3,000 in the 1920's.

RUSSEL CROUSE.

CURRY, Jabez Lamar Monroe, American educator and diplomat: b. Lincoln County, Ga., June 5, 1825; d. Asheville, N. C., Feb. 12, 1903. He was graduated at the University of Georgia in 1843 and at Harvard Law School in 1845. He served in the Alabama legislature from 1847 to 1855 and in Congress from 1857 to 1861, and then became a member of the Confederate Congress. He became a Baptist minister; served in the Confederate Army; was president of Howard College, 1866-1868; and in 1881 was appointed general agent of the Peabody Educational Fund and later also of the Slater Educational Funds. He was minister to Spain, 1885-1889, and special ambassador from the United States at the coronation of King Alfonso XIII of Spain, May 17, 1902.

CURRY, John Stuart, American artist: b. near Dunavant, Kans., Nov. 14, 1897; d. Madison, Wis., Aug. 29, 1946. Born of farmer parents and raised in Kansas, Curry received art instruction at the Chicago Art Institute (1916-1918) and attended Geneva College (1918). After residence (1921-1926) in New York and Westport, Conn., as an illustrator for popular magazines, Curry went to Paris in late 1926 for study at the Russian Academy. Following his return in June 1927, he studied at the Art Students League in New York.

Shortly afterward, Curry's oils and watercolors of life on the Kansas farmlands began to win mounting admiration. In 1929, he completed *The Tornado*, his best-known and possibly best painting, and a year later, his first major oil, *Baptism in Kansas* (1928), was purchased by the Whitney Museum, and the Whitney Studio Club provided him with his first one-man show.

Two years later, Curry accompanied a touring circus and produced an array of outstanding oils which included *Circus Elephants*, *Agony of the Clowns*, *Aerialists*, and *The Flying Cadonas*, the latter considered one of the finest circus paintings ever executed.

During the balance of the 1930's, in addition to teaching at Cooper Union (1932-1934) and the Art Students League (1932-1936), Curry devoted much energy to painting mural decorations: *Western Migration* and *Justice Defeating Mob Violence*, created in 1936-1937 for the De-

partment of Justice Building in Washington, D.C.; *The Homestead* and *The Oklahoma Land Rush*, executed in 1938 for the Department of the Interior Building; and, for the Kansas State House, the controversial murals, including the famous John Brown panel, on which he worked periodically between 1938 and 1942. In 1936, Curry moved on to the Agricultural College of the University of Wisconsin, where until his death he served as artist-in-residence and worked on a number of murals for several campus buildings.

Curry came inevitably to be grouped with Grant Wood and Thomas Benton as an outstanding exponent of "American Scene" painting, which was considered to be in reaction to the work of American contemporaries too strongly imitative of the European modernism which had invaded the United States in the 1920's. Curry's canvasses exhibited an expert sense of coloration and a skillful clarity of drawing which vigorously conveyed the power and tension frequently implicit in his subject matter. His subjects ranged from the flood and storm scenes of *The Mississippi* (1935), *Sanctuary* (1935), and *Dust Storm* (watercolor, 1930), to placid landscapes like *First Snow* (1930) and *Kansas Wheat Ranch* (1930), and, in addition to his circus studies included oils and lithographs devoted to football and boxing. *Spring Shower* (1931), *Line Storm* (1934), and *Wisconsin Landscape* (1940), are generally considered to be Curry's finest landscapes.

Consult Schmeckebier, L. E., *John Stewart Curry's Pageant of America* (New York 1943).

CURRY POWDER and **CURRY PASTE**, compound condiment added to cooked dishes of meat and rice to render them piquant and appetizing. So generally is curry powder employed in East Indian cookery that it has been called the "salt of the Orient." The substances that commonly form the bases of these powders are turmeric, fenugreek and sago. To these ginger, black and Cayenne pepper, coriander, caraway and many other spices are added in varying quantities, or omitted, according to the locality. The basis of many curry pastes is tamarind.

CURTESY, kûr'tě-si, in law, a life interest which a husband acquires, at common law, in the real estate of his wife upon the birth of lawful issue, alive and capable of inheriting. At the time it originates, this interest is called "curtesy initiate." It becomes "curtesy consummate" upon the death of the wife during the husband's lifetime. Due to its inconsistency with modern ideas as to the right of women to own, possess and control their property, curtesy has been abolished or drastically modified both in England and the United States by constitutional and statutory provisions.

CURTILAGE, kûr'tí-līj, the enclosed space of ground and buildings immediately surrounding or lying near a dwelling and used for its convenient occupation or a yard or courtyard. The term is of feudal origin and originally meant a castle and outbuildings enclosed in a stone wall for defense. The law has always given the curtilage greater protection than outside property, and this idea prevails today, as in most jurisdictions breaking and entering curtilage is bur-

glary, and setting fire to any building in it constitutes arson.

CURTIN, kûr'tin, **Jeremiah**, American linguist and antiquarian: b. Milwaukee, Wis., 1838; d. Burlington, Vt., Dec. 14, 1906. He prepared for Harvard and was graduated there in 1863. At the university he became an excellent linguist. In 1864 he entered the diplomatic service, becoming secretary of legation for the United States at St. Petersburg, where he remained until 1870. During his stay in Russia he made a study of Slavonic and allied languages. This knowledge he turned to account in his translations of Tolstoy, Zagoskin and Sienkiewicz, being the first to introduce the latter to the English-speaking world. From 1883 to 1891 he was connected with the bureau of Ethnology of the Smithsonian Institution. Afterward he made independent researches concerning the North American Indians. He was reputed to have known 70 languages, 12 more than the redoubtable Cardinal Mezzofanti. By his translations from the Russian, Polish, Czech and other languages he added enormously to our knowledge of foreign literature. Besides his translations he wrote *Myths and Folklore of Ireland* (1906), *Creation Myths of Primitive America* (1898), *The Mongols* (1907), *The Mongols in Russia* (1908), *A Journey in Southern Russia* (1909), *Myths of the Medocs* (1912).

CURTIN, John, prime minister of Australia: b. Creswick Victoria, Australia, Jan. 8, 1885; d. Canberra, July 5, 1945. Chief of Australia's Labour Party after 1935 and prime minister and minister for defense six years later, Curtin came into world prominence in December 1941 as political head of a country suddenly faced with the immediate threat of Japanese invasion, and rapidly developed into a vigorous fighting leader of the Australian people. Son of the late John Curtin, police officer of Creswick, he was educated in the state schools. At the age of 14, he took a job with a country newspaper as printer's boy; was later copy boy for a Melbourne daily and page at a Melbourne club. In his early twenties, he developed an interest in the Australian Labour Party, which first became a political factor in 1904 under the leadership of John C. Watson. In 1911, he was named secretary of the Victoria branch of the Timber Workers' Union, and had considerable success as an organizer and propagandist. In 1917, he was sent to Western Australia as editor of the *Western Worker*, official labor organ for that state. At the conference of the International Labor Office, Geneva, in 1924, he was Australia's workers' representative. In 1928, he became a member of the federal Parliament, holding the Fremantle (Western Australia) seat in the House of Representatives until defeated in 1931; he regained the Fremantle seat in 1934, and held it until 1945. Curtin was elected Labour Party leader in October 1935, and automatically became leader of the Opposition in the federal Parliament. At that time his party was handicapped by internal feuds and somewhat discredited. He took hold, slowly restored its prestige, and by 1939, had it ranged solidly behind him. With the beginning of World War II, however, he sought to abolish political differences while the nation was in danger, and lent every assistance to Robert G. Menzies, then prime minister. It is

generally conceded that Australia's Advisory War Council, composed of members of all parties and established by the Menzies government, is a product of Curtin's planning. When he took office as prime minister in October 1941, following the resignation of Menzies and the defeat of Menzies' successor, Fadden, he carried a united party to power, one which under his leadership concentrated upon an efficient prosecution of Australia's war effort to the exclusion of party interests. When Curtin and his Labourite Cabinet were bracing the country to stand off an invasion, he gave Australians probably the grimmest talk they had heard in their 155 years' history. He backed his words with a series of government directives that imposed a manpower draft on labor; cut nonwar industry to a fraction of its prewar output; banned non-essential long distance travel; put white collar workers to building military roads; and ushered in what Australians have come to call "Curtin's Austerity Regime." He gave them a war-winning government. The results of the general election of 1943, in which Labour took 54 of 75 seats in the House, and 22 of 36 seats in the Senate, have been interpreted in most quarters as a personal victory for Curtin, whose middle-of-the-road policy won for his party the support of former antilabor elements. In January 1944, with an eye toward Australia's postwar future, Curtin concluded an agreement at Canberra with New Zealand's Prime Minister Peter Fraser for co-operation in the South Pacific. This conference, headed by Curtin and Fraser, proposed a South Seas Regional Conference, including Australia, New Zealand, Great Britain, France, and the United States, for postwar development of adjacent islands. In the spring of 1944, he went to London for the conference of Dominion prime ministers, convened to discuss the mutual problems and future plans of the British Commonwealth of Nations.

Long a firm friend of the United States, Curtin's deep feeling or kinship with the Americans was further strengthened by his association with Gen. Douglas MacArthur, Supreme Allied Commander in the Southwest Pacific, during the tense months preceding the Allied shift from the defensive to the offensive in the Pacific.

CURTIS, kûr'tis, Alfred A., American Catholic prelate: b. Somerset County, Md., July 4, 1831; d. July 11, 1908. He was ordained in the Episcopal ministry and for several years labored in Baltimore and western Maryland, finally returning to Baltimore. Later he resigned his ministerial duties, entered the Catholic Church, was ordained priest by Archbishop Bayley, Dec. 17, 1874, and stationed at Baltimore Cathedral until Nov. 14, 1886, when he was consecrated bishop of Wilmington, Del. He resigned in 1896 and in 1898 became Cardinal Gibbon's vice-general of Baltimore.

CURTIS, Benjamin Robbins, American jurist: b. Watertown, Mass., Nov. 4, 1809; d. Newport, R. I., Sept. 15, 1874. He was graduated at Harvard 1829; was admitted to the bar 1832, and rose rapidly to the height of his profession in Boston, Mass. He was appointed to the United States Supreme Court 1851, and in the famous Dred Scott case made a powerful argument dissenting from the court's decision. Resigning in 1857, he was a member of the state

legislature for two years; and in 1868 one of the counsel for the defense in the impeachment trial of Andrew Johnson. His writings include *Reports of Cases in the Circuit Courts of the United States* (1854); *Decisions of the Supreme Court of the United States, with notes and a digest*; *Jurisdiction, Practice, and Peculiar Jurisdiction of the Courts of the United States* (1880).

CURTIS, Charles, American statesman and 31st vice president of the United States: b. North Topeka, Kans., Jan. 25, 1860; d. Washington, D.C., Feb. 8, 1936. His mother was a quarter-blood member of the Kaw tribe of Indians. After studying law he was admitted to the bar in 1881. In 1884 and again in 1886 he was county attorney of Shawnee County. From 1893 to 1897 he served in Congress from the Fourth Kansas District and from 1897 to 1907 represented the First District of the state. He resigned from the House in 1907 upon his election to the United States Senate to fill an unexpired term and was the first Indian to hold such office. He was a candidate for re-election in 1912, but was defeated. He was elected, however, for the terms 1915-1921 and 1921-1929. In 1929 he was elected vice president of the United States.

CURTIS, Charles Gordon, American inventor: b. Boston, Mass., April 20, 1860; d. Central Islip, L. I., March 10, 1953. Curtis was an engineer and industrialist whose invention of steam and gas turbines brought him international recognition.

He received his C. E. degree from Columbia University in 1881 (M.S. 1907), and an I.L.B. in 1883 from New York Law School. After eight years of practice as a patent lawyer, he founded the C. and C. Electric Motor Company to produce the first electric fan. In 1896 he patented his steam turbine which provided a new method of controlling speed. Widely used in the propulsion machinery of ocean liners, it was made by the Curtis Electric Manufacturing Company until 1902 when the General Electric Company purchased the land rights for \$1.5 million. The principle of this turbine was utilized by the United States Navy in a propelling mechanism for torpedoes.

Curtis also designed a turbine for the British, Japanese, German, and United States navies and secured patents on a series of diesel improvements. An associate of Thomas A. Edison, he received a number of awards, notably the Count Rumford gold and silver medals from the American Society of Arts and Sciences. He was also active in the Curtis Gas Engine Company and retired president of the International Curtis Marine Turbine Company.

CURTIS, Cyrus Hermann Kotzschmar, American publisher: b. Portland, Maine, June 18, 1850; d. Wyncote, Pa., June 7, 1933. In 1876 he removed to Philadelphia where he became publisher of the *Tribune and Farmer*. He later established the *Ladies' Home Journal* and made it one of the most successful periodicals in the United States. The Curtis Publishing Company, of which he became head, published, in addition to the *Ladies' Home Journal* the *Country Gentleman* and the *Saturday Evening Post*. Under Curtis's management the *Saturday Eve-*

ning Post attained a larger circulation than had hitherto been reached by any American periodical. In 1913 he purchased the Philadelphia *Public Ledger*, in 1923 the New York *Evening Post*, and in 1930 the Philadelphia *Inquirer*.

CURTIS, Edward S., American author and photographer: b. Madison, Wis., Feb. 19, 1868; d. Los Angeles, Calif., Oct. 19, 1952. Official photographer of the E. H. Harriman expedition to Alaska in 1898, eight years later he obtained the financial support of J. P. Morgan in a project for a multivolumed series of books on the history of North American Indians, to be written and illustrated by himself. President Theodore Roosevelt provided the foreword for this monumental series to which Curtis devoted the rest of his life.

CURTIS, George Carroll, American geographic sculptor: b. Abington, Mass., July 15, 1872; d. Feb. 2, 1926. He was educated at Harvard University, where he became an assistant in the geological department. Later he became assistant field geologist of the United States Geological Survey. He was the first to apply aerial perspective to topographical models; this he did in models of Boston and vicinity, and of the city of Washington as it existed and as it would appear if a proposed development were carried out. A member of the expedition to the West Indian eruptions he was the first to visit the crater of La Soufrière and discovered the new summit of Mount Pelée. Besides his special geological and topographical articles, he is author and illustrator of *A Description of the Topographical Model of Metropolitan Boston* (1900).

CURTIS, George Ticknor, American lawyer, author and publisher: b. Watertown, Mass., Nov. 28, 1812; d. New York, March 28, 1894. He was graduated from Harvard in 1832, admitted to the bar (Boston, Mass.) in 1836 and practiced in Worcester, Mass., and Boston. From 1840 he sat three years in the lower house of the Massachusetts legislature, after which he devoted himself entirely to law and literature. One of his earliest literary productions was a pamphlet advocating state compensation for the destruction by a mob of the Ursuline Convent in Charlestown, Mass. His ability as a patent lawyer gained him the patronage of many distinguished inventors. He strongly supported the compromise measures of 1850, and in 1857 participated in the famous Dred Scott case in the Supreme Court of the United States, claiming the power of Congress to prohibit slavery. Besides many contributions to the press he published a number of authoritative works on law and constitutional history, the more celebrated ones being a *Digest of Cases Adjudicated in the Courts of Admiralty in the United States, and in the High Court of Admiralty in England*. . . . (1839); *A Treatise on the Rights and Duties of Merchant Seamen* (1841); *Treatise on the Law of Copyright* (1847); *Treatise on the Law of Patents* (1849); *History of the Origin, Foundation and Adoption of the Constitution* (1854-1858); *Life of Daniel Webster* (1870); *Life of James Buchanan* (1883).

CURTIS, George William, American essayist and journalist: b. Providence, R. I., Feb. 24, 1824; d. New Brighton, Staten Island, N. Y.,

Aug. 31, 1892. At 18 he spent some months at Brook Farm (q.v.) and a few years later visited Europe, Egypt, and Syria, the results of his travels appearing in *Niles Notes of a Howadji* (1851); and *The Howadji in Syria* (1852). He was an early sympathizer with the abolition movement and as the editor of *Harper's Weekly* for nearly a generation exercised a measurable influence over the more thoughtful of his countrymen. From 1854 until not long before his death he edited "The Easy Chair" department of *Harper's Magazine*, and it is by his "Easy Chair" essays that he is likely to be longest remembered. In these are displayed a gentle persuasiveness of argument and a fund of humor which made them very attractive reading, while the style was at all times polished and graceful. In them he touched upon the varied topics of the day, the lighter as well as the more serious, and since his death several small volumes of selections from them have been published. He was one of the leaders of the Republican Party at its outset and in his later years was conspicuous as an advocate of civil service reform and of independent action in politics. As a lecturer and orator he was very popular, and several of his political speeches and orations upon special occasions take high rank among specimens of American oratory. Besides the volumes already named he published *Lotus-Eating* (1852); *The Potiphar Papers* (1853); *Prue and I* (1857); *Trumps* (1861). These are more or less ephemeral in their nature. His *Orations and Addresses*, edited by C. E. Norton, appeared in 3 vols., 1893-1894. (See ESSAYS FROM THE EASY CHAIR.)

CURTIS, Samuel Ryan, American soldier: b. near Champlain, N. Y., Feb. 3, 1807; d. Cornhill Bluffs, Iowa, Dec. 26, 1866. He was graduated at West Point 1831, but resigned to become a civil engineer. He studied law, was admitted to the bar and practiced from 1843 to 1845. He served as colonel in the Mexican War, and was a Republican congressman from his state 1858-1861. He was commissioned a brigadier general May 17, 1861; defeated Generals Price and McCulloch in a decisive engagement at Pea Ridge, Ark., and was promoted major general March 21, 1862. He subsequently commanded the departments of Missouri (1862-1863), of Kansas (1864), and in the spring of 1865, the Department of the Northwest.

CURTIS, William Eleroy, American journalist: b. Akron, Ohio, Nov. 5, 1850; d. 1911. He was graduated at Western Reserve University in 1871. From 1873 to 1887 he was on the staff of the Chicago *Inter-Ocean*, and by securing interviews with the James brothers, during their contest with Pinkerton's detectives, and in investigating the Ku-Klux Klan of the South gained a national reputation. He was a commissioner of the United States to the Central and South American republics in 1885, and executive officer of the International American Conference of 1889-1890. His works include *Children of the Sun* (1882); *Capitals of Spanish America* (1888); *The Land of the Nihilist* (1888); *Japan Sketches*; *Venezuela* (1891); *Life of Zachariah Chandler*; *The Yankees of the East* (1896); *Today in France and Germany* (1897); *Between the Andes and the Ocean* (1900). He was director of the Bureau of American Republics 1890-1893, and chief of the Latin American department and his-

torical section of the World's Columbian Exposition 1891-1893.

CURTISS, Glenn Hammond, American aviator and inventor: b. Hammondsport, N. Y., May 21, 1878; d. Buffalo, N. Y., July 23, 1930. As a village boy in Western New York he evinced a talent for mechanics and a love of speed, winning many bicycle races at county fairs. After managing the village bicycle shop he opened one of his own. In 1902 he founded at Hammondsport a company to make and sell motors, motorcycles, and accessories, having in the meanwhile become an ardent motorcycle racer. At Ormond Beach, Fla., he set a speed record in 1904 that endured over seven years. With T. S. Baldwin he built the first U.S. Army dirigible in 1905. The third airplane of his construction won the *Scientific American* award in 1908, and he won the trophy again a year later, when he also won the Gordon Bennett Cup and *Prix de la Vitesse* at Reims, France. By 1912 he had perfected his hydroaeroplane or so-called flying boat. During World War I he developed the Wasp motor, with which world records for speed and altitude were achieved. He built for the U.S. Navy the Navy-Curtiss flying boats 1, 2, 3, 4, the latter being the first aircraft of any kind to cross the Atlantic (1919).

Consult Studer, Clara, *Sky Storming Yankee* (Harrisburg, Pa., 1937)

CURTIUS, kŏr'tsê-ŏs, **Ernst**, German Hellenist: b. Lübeck, Sept. 2, 1814; d. Berlin, July 12, 1896. He was educated at Göttingen, Bonn and Berlin, and in 1844 was appointed professor at Berlin and preceptor of the Crown Prince Frederick William, afterward Frederick III. In 1856 he succeeded Hermann as professor at Göttingen, and in 1868 was called again to Berlin University. From 1853 Curtius was a member of the Royal Academy of Sciences, and from 1871 to 1893 he was continuously secretary of the philologico-historical section of that institution. Under imperial commission in 1874 he negotiated with the Greek government in regard to the German excavations at Olympia, begun by him in the following year. Of his works which mostly relate to Greek antiquities, the best known is his *History of Greece* (1857-1861).

CURTIUS, kŭr'shĭ-ŭs, **Marcus** or **Mettus** Roman legendary hero, who, according to tradition, sacrificed himself for the good of his country. In 362 B.C. it is said a chasm opened in the Roman forum, from which issued pestilential vapors. The oracle declared that the chasm would close whenever that which constituted the glory of Rome should be thrown into it. Curtius asked if any thing in Rome was more precious than arms and valor; and being answered in the negative, arrayed himself in armor, mounted a horse splendidly equipped, solemnly devoted himself to death in presence of the Roman people and sprang into the abyss, which instantly closed over him. The locus Curtius, which marked the spot has been discovered by the modern archaeologist. An altar was erected on the spot and a regular sacrifice offered there.

CURTIUS RUFUS, kŭr'shĭ-ŭs rŏŏ'fŭs **Quintus**, Latin biographer. He wrote the history of Alexander the Great in 10 books, the first two of which are lost. The exact period in which

he flourished is not known; for though his style would indicate that he lived in one of the best periods of the Latin language, no writer of any earlier date than the 12th century has made any mention of his work. His information is inaccurate and the book is, on the whole, unreliable. The style is generally polished and elegant.

CURULE MAGISTRATES, kŭ'rŏol māj'is-trāt. The highest magistrates of the Roman Republic (consuls, praetors, dictators, military tribunes, censors, and patrician aediles) were called *magistratus curules* because they alone had the privilege of sitting on an ivory chair (*sella curulis*) when exercising public functions. The *sella curulis*, one of the official insignia of the higher magistrates, was probably of Etruscan origin.

CURVES, Higher Plane. A curve can be looked upon in many ways; geometrically as the intersection of two surfaces, as the locus of a moving point, or envelope of a moving line; analytically as a representation of an equation in point- or line-coordinates, and therefore as yielding a singly infinite system of points or lines. But if this view be adopted, the "curve" must not necessarily be regarded as identical with the system of points; for most curves (not all) have tangents, hence a curve yields also a system of lines, of equal importance with the system of points; a definition that lays stress on one system to the exclusion of the other is incomplete. This was recognized by Julius Plücker (*Theorie der algebraischen Curven*, 1839, p. 200), in his statement of the dual generation of a curve: "If a point continually moves along a straight line, while the line continually rotates about the point, one and the same curve is enveloped by the line and described by the point." One authority treats the true curve as an undefined entity, of which the assemblages of points and lines are two distinct manifestations. The present tendency is toward this view, at least as regards an algebraic curve—a curve whose equation, whether in point- or line-coordinates, is algebraic. A curve whose Cartesian equation cannot be reduced to an algebraic form, e.g., $y = \sin x$, is non-algebraic or transcendental. It is convenient to treat first of algebraic curves.

If x, y satisfy an algebraic equation $f(x, y) = 0$, it can be shown that $\frac{dy}{dx}$ has a definite value $\left(= -\frac{\partial f}{\partial x} : \frac{\partial f}{\partial y} \right)$ unless both $\frac{\partial f}{\partial x}$ and $\frac{\partial f}{\partial y}$ vanish. There is therefore a tangent, $Y - y = (X - x) \frac{dy}{dx}$, i.e., $(X - x) \frac{\partial f}{\partial y} + (Y - y) \frac{\partial f}{\partial x} = 0$; in homogeneous coordinates

$$X \frac{\partial f}{\partial x} + Y \frac{\partial f}{\partial y} + Z \frac{\partial f}{\partial z} = 0.$$

The coordinates of the tangent are: $\xi : \eta : \zeta = \frac{\partial f}{\partial x} : \frac{\partial f}{\partial y} : \frac{\partial f}{\partial z}$; the elimination of x, y, z from these equations and $f(x, y, z) = 0$ gives an algebraic equation $\phi(\xi, \eta, \zeta) = 0$, the line equation (tangential equation) of the curve. Thus the curve has two equations, both algebraic, a point equation of degree m , a line equation of degree n ; these two numbers m, n , the order and class of the curve, are the number of points that lie on an arbitrary line, the num-

ber of tangents that pass through an arbitrary point; they belong respectively to the point system and the line system, not to the curve itself. A number that is more intimately associated with the curve is the genus, p , to be defined later.

An algebraic curve cannot break off; the tangent cannot suffer a sudden change in direction; no finite part of the curve can coincide with a straight line. Thus the normal character of an arc of an algebraic curve expresses gradual and continuous change of position (motion of point), gradual and continuous change of direction (motion of tangent), as stated by Plücker.

The number of terms in the equation $f(x, y, z) = 0$ is $\frac{1}{2}(m+1)(m+2)$; the number of disposable constants is therefore $\frac{1}{2}(m+1)(m+2) - 1$, i.e., $\frac{1}{2}m(m+3)$. Hence passage through $\frac{1}{2}m(m+3)$ arbitrary points determines the curve; while if the curve passes through $\frac{1}{2}m(m+3) - q$ arbitrary points, the coefficients can be expressed linearly in terms of q parameters, and the curve has q degrees of freedom. If the points are not arbitrary, the curve may have mobility greater than q , or it may break up into curves of lower order. The theory is really that of the intersections of curves. Two curves of orders m, m' intersect in mm' points, for the elimination of z from the equations produces an equation of degree mm' for $x:y$. The m^2 intersections of two m -ics, u, v , do not determine an m -ic (although $m^2 > \frac{1}{2}m(m+3)$), for all curves $u + kv = 0$ pass through the points; the m^2 points impose precisely $\frac{1}{2}m(m+3) - 1$ conditions. Similarly, the mm' intersections of C_m and $C_{m'}$ do not impose independent conditions on all curves; e. g., the 20 intersections of C_4 and C_5 impose 14 conditions on a quartic, 17 on a quintic, 19 on a sextic, but 20 on all higher curves. The most convenient statement is: the quartic excess is 6, the quintic excess is 3, the sextic excess is 1 (Macaulay). The first notice of theorems of this character is due to Maclaurin (1720); the first explanation was given by Euler and Cramer (1748-50). From these has arisen the whole modern theory of groups of points on a curve (geometry on a curve). (Scott, 'Bull. Am. Math. Soc.', 2d series, v. 4, pp. 260-273; 1897-98).

The fundamental theorem is the Cayley-Bacharach theorem (1843, 1886); a C_n through all except $\frac{1}{2}(l+m-n-1)(l+m-n-2)$ of the intersections of C_l and C_m will pass through the remainder unless these lie on a curve of order $l+m-n-3$. In particular if $(l=n)$, precisely $\frac{1}{2}(m-1)(m-2)$ of the intersections of a fixed C_m by a variable C_n are a consequence of the rest if $n > m-3$; but if $n \leq m-3$, fewer than $\frac{1}{2}(m-1)(m-2)$ are a consequence. Thus no matter what the order of the cutting curve, the number of the induced intersections can never exceed $\frac{1}{2}(m-1)(m-2)$. This number, which limits the interconnection of points on the curve of order m , is called the genus of the curve, and is usually denoted by p . The genus of a quartic, e. g., is 3; 3 points on a quartic follow from 5 intersections with a conic, or from 9, 13, 17 intersections with a cubic, quartic or quintic, and so on.

If a curve has multiple points, corresponding theorems hold and preserve their significance,

provided the cutting curve is an adjoint curve, that is, a curve with a multiple point of order $k-1$ where the fixed curve has a multiple point of order k . The genus, the number p which limits the interconnection, is in this case $\frac{1}{2}(m-1)(m-2) - \frac{1}{2}\Sigma k(k-1)$. (Macaulay, 'Proc. Lond. Math. Soc.', v. 26, pp. 495-544; 1895; Hardcastle, F., 'Report on Point-Groups,' in progress in Proc. of the Brit. Assoc.; Brill-Noether Bericht, 'Die Entwicklung der Theorie der algebraischen Functionen in älterer und neuerer Zeit' (1894).

Multiple points arise when two or more points of the system occupy the same position in the plane; according to the number of points that coincide, the point is double, triple, etc. Double points (dps) are nodes or cusps; a node is the coincidence of two non-consecutive points, a cusp is the coincidence of two consecutive points; similarly double tangents are either bitangents or inflexional tangents. The cusp and inflexional tangent are also called stationary point and line, on account of the effect of the singularity on the motion of the point and line by which the curve is described.

The coincidence of two points at P causes an arbitrary line through P to meet the curve in two points there; hence if P be taken as origin, the terms of the first degree in the equation will vanish. The conditions for a double point at x, y, z are therefore the vanishing of $f, \frac{\partial f}{\partial x}, \frac{\partial f}{\partial y}$ (in homogeneous co-ordinates,

of $\frac{\partial f}{\partial x}, \frac{\partial f}{\partial y}, \frac{\partial f}{\partial z}$). Two lines can be found to meet

the curve in more than two points at P ; these are the tangents; they are given by the terms of degree 2 equated to zero. Similarly the conditions for a k -point are the vanishing of the

$\frac{1}{2}k(k+1)$ derivatives $\frac{\partial^{k-1}f}{\partial x^k \partial y^2 \partial z^2}$ ($a+\beta+\gamma=k-1$),

and there are k tangents, lines which meet the curve in more than k points.

If the tangents at a dp are distinct, the point is a node, formed by the crossing of two simple branches, real or imaginary according as the tangents are real or imaginary. In this last case, the point is detached from the main body of the curve, and is called an isolated point, or acnode, the visible crossing being called a node, or crunode. If the tangents are coincident, and meet the curve in precisely three points, the point is a cusp; if the coincident tangents meet the curve in more than three points, the singularity is complex.

Elimination of $x:y:z$ from $\frac{\partial f}{\partial x} = 0, \frac{\partial f}{\partial y} = 0, \frac{\partial f}{\partial z} = 0$ gives a condition, $D=0$, to be satisfied by the equation of any curve that has a dp. Hence a general locus of order m has no point-singularities, and a general envelope of class n has no line-singularities. But a general envelope has point-singularities and a general locus has line-singularities; for the direction of a tangent, given by the value of $\frac{dy}{dx}$, is un-

changed if $\frac{\partial^2 y}{\partial x^2} = 0$, i.e., if

$$\frac{\partial^2 f}{\partial x^2} \left(\frac{\partial f}{\partial y} \right)^2 - 2 \frac{\partial^2 f}{\partial x \partial y} \cdot \frac{\partial f}{\partial x} \cdot \frac{\partial f}{\partial y} + \frac{\partial^2 f}{\partial y^2} \left(\frac{\partial f}{\partial x} \right)^2 = 0.$$

This condition, and $f=0$, are only two equations, and consequently no condition is imposed on the locus by the existence of line-singularities.

If a curve of order m , class n , has ν nodes, κ cusps, τ bitangents, ι inflexional tangents, these numbers are connected by Plücker's equations. The tangent at x, y, z is

$$X \frac{\partial f}{\partial x} + Y \frac{\partial f}{\partial y} + Z \frac{\partial f}{\partial z} = 0;$$

this passes through x', y', z' if x, y, z lie on the curve $x' \frac{\partial f}{\partial x} + y' \frac{\partial f}{\partial y} + z' \frac{\partial f}{\partial z} = 0$, the polar of x', y', z' with respect to f . Since this curve, $df=0$, is of order $m-1$, it meets f in $m(m-1)$ points; two of these lie at every node, three at every cusp; hence the number of tangents from x', y', z' is

$$n = m(m-1) - 2\nu - 3\kappa. \quad (1)$$

Similarly from the line-equation,

$$m = n(n-1) - 2\tau - 3\iota. \quad (1')$$

The condition that the tangent at x, y, z be stationary becomes in homogeneous co-ordinates

$$\begin{vmatrix} \frac{\partial^2 f}{\partial x^2} & \frac{\partial^2 f}{\partial x \partial y} & \frac{\partial^2 f}{\partial x \partial z} \\ \frac{\partial^2 f}{\partial x \partial y} & \frac{\partial^2 f}{\partial y^2} & \frac{\partial^2 f}{\partial y \partial z} \\ \frac{\partial^2 f}{\partial x \partial z} & \frac{\partial^2 f}{\partial y \partial z} & \frac{\partial^2 f}{\partial z^2} \end{vmatrix} = 0;$$

the point of contact must lie on this curve, $H(f)=0$, the Hessian of f , of order $3(m-2)$. At a node on f , H has a node with the same tangents; at a cusp, H has a triple point, composed of two branches touching the cuspidal tangent with one branch cutting it; the numbers of intersections are 6 and 8. Hence

$$\iota = 3m(m-2) - 6\nu - 8\kappa, \quad (2)$$

and reciprocally

$$\kappa = 3n(n-2) - 6\tau - 8\iota. \quad (2')$$

Any one of these four equations can be obtained algebraically from the others. From these we can find also (3 and 3') expressions for τ in terms of m, ν, κ , and for ν in terms of n, τ, ι .

These six are Plücker's equations; three only are independent. It must not however be supposed that we can choose any three of the numbers arbitrarily. There is a limit to the number of dps that a proper curve can have; $\nu + \kappa > \frac{1}{2}(m-1)(m-2)$. For if the curve had one more, a curve of order $m-2$ could be passed through the dps and $m-3$ other points on the curve; but this would have with f intersections in number $2[\frac{1}{2}(m-1)(m-2)+1] + m-3$; i.e., $m(m-2)+1$, which is impossible. A curve can actually have this number of dps; it is then called rational (or unicursal), because the co-ordinates of any point can be expressed rationally in terms of a parameter, as follows: The dps and $m-3$ other points on f determine $(m-2)$ -ics with one degree of freedom, a system $u + kv=0$. Of the $m(m-2)$ intersections of one of these with f , all except one are at the fixed points; the co-ordinates of the one remaining variable intersection are therefore given rationally in terms of the parameter k by $f=0, u + kv=0$.

If the curve has not this number of dps, let it have $\delta (= \nu + \kappa)$; the number $\frac{1}{2}(m-1)(m-2) - \delta$, which has already been given as the genus, was originally called the deficiency of the curve (Cayley).^{*} From Plücker's equations we find

$\frac{1}{2}(m-1)(m-2) - \nu - \kappa = \frac{1}{2}(n-1)(n-2) - \tau - \iota$, i.e., the point deficiency and the line deficiency are equal; the deficiency (or genus) does not belong specially to the point system or the line system. In particular, if the curve is rational quâ locus, it is rational quâ envelope. If we introduce p for the genus, the equations assume a convenient form,

$$n + \kappa = 2m + 2(p-1), \quad m + \iota = 2n + 2(p-1), \\ m(m-3) - 2(\nu + \kappa) = 2(p-1) = n(n-3) - 2(\tau + \iota).$$

There are other limitations on these numbers, but the theory is not complete. Clebsch proved (Crelle, v. 64, p. 51; 1864) that the number of cusps on a rational curve cannot exceed $\frac{1}{2}(m-2)$; the more general question as to the maximum number of cusps for a curve of assigned order awaits solution.

So far the singularities have been supposed to be simple. A multiple point of order higher than the second is, in a certain sense, equivalent to a number of simple singularities. If the tangents at a k -point are distinct, the point arises from the crossing of k branches; these cause $\frac{1}{2}k(k-1)$ intersections, nodes by the geometrical definition. It can be shown that such a point reduces the class of the curve, the number of inflexions, and the genus, by $2 \times \frac{1}{2}k(k-1)$, $6 \times \frac{1}{2}k(k-1)$, $\frac{1}{2}k(k-1)$ respectively. Thus not only is the point explained geometrically by $\frac{1}{2}k(k-1)$ nodes, but as regards Plücker's equations it is equivalent to these nodes. Nevertheless the point cannot be replaced by these nodes for all purposes, e.g., as regards the number of conditions; the k -point imposes $\frac{1}{2}k(k+1)$ conditions, whereas the nodes would impose $\frac{1}{2}k(k-1)$, i.e., $\frac{1}{2}k(k+1) + k(k-1)$. It is an important fact that this equivalence does hold as regards the conditions imposed on adjoint curves; the presence of the $(k-1)$ -point on the adjoint imposes $\frac{1}{2}k(k-1)$ conditions, equal to the number that would be imposed on the adjoint by $\frac{1}{2}k(k-1)$ separate nodes on f .

If the tangents are not distinct, the matter may become very complicated. The multiple point immediately revealed by the equation may be but one of a series of multiple points indefinitely close together, and the singularity then involves also multiple tangents. The determination of the point- and line-components, the "analysis of higher singularities," has received much attention. If the singularities are regarded as singularities of the equation, the question is properly considered from the algebraic standpoint. At an ordinary point of the curve, y can be expanded in an ascending series of positive integral powers of x , provided $x=0$ is not the tangent; at a k -point the process is not directly applicable, it requires some modifications, and then leads to k expansions, with exponents either integral or fractional. An expansion with fractional exponents, whose L.C.D. is q , is accompanied by the $q-1$ conjugate

^{*}During the last 30 years the whole theory of plane algebraic curves has been modified in important points by the influence of the theory of functions; in particular, this has shown the significance of the genus.

expansions, thus forming a cycle of order q (Puiseux). The integral expansion is a cycle, $q=1$, and the k -point is represented by a number of cycles of orders q_1, q_2, q_3, \dots where $\sum q_i = k$. The number of cusps in a cycle is $q-1$; this agrees with the known facts about the simple cusp ($y=x^2, y=-x^2$), and is accepted as the algebraic definition of cusps. The algebraic definition of a node is indirect; v is determined so that $2v+3\kappa$ shall be equal to twice the total number of intersections of all the branches (the discriminantal index of the singularity); it is proved that this definition yields always a positive integral value for v . (Chrystal, 'Algebra,' v. 2, 1889, pp. 359-371; Harkness and Morley, 'Treatise on the Theory of Functions,' 1893, pp. 127-151; Brill-Noether Bericht, pp. 367-402 for full references; 'Die Entwicklung der Theorie der algebraischen Functionen in älterer und neuerer Zeit' 1894).

The process as outlined above, dealing with the expansions as a whole, simply enumerates the components, algebraically defined, of a singularity; it affords no clue to the structure. This structure can however be put in evidence by means of the critical exponents of the expansions, those in whose denominators a new factor appears. These show that the dps are combined into certain multiple points, and thus they lead to an algebraic description of the singularity. (Smith, H. J. S., 'Proc. Lond. Math. Soc.,' v. 6, pp. 153-182; 1876; Halphén, 'Mém. prés. à l'Ac. des Sc. de Paris,' v. 26, 1877; Zeuthen, 'Math. Ann.,' v. 10, pp. 210-220, 1876). A different treatment of the expansions, due to Noether, gives a clearer idea of the structure.

By a geometrical process, depending on the simplest Cremona transformation (see below), it is possible not only to enumerate the multiple points and lines contained in any singularity, but also to construct a penultimate form to indicate the arrangement of these components. (Scott, 'Am. J. Math.,' v. 14, pp. 301-325; v. 15, pp. 221-243; 1892-93).

The various processes lead to the following conclusions as to the content of a complex singularity. The point-equation by its lowest terms gives the order, k , of the singularity; the line-equation gives the class, l . If the singularity has all its tangents coincident (if it has not, it can be broken up into simpler ones) then order + class = number of intersections with the tangent at the point, and thus the class is known without reference to the line-equation. Coincident tangents may lead to other multiple points, or to chains of multiple points, contained in the singularity; if the total number of dps in these is h , the singularity has h latent double points. It has also latent double lines, h' in number, and it has been proved that $h'=h$. The singularity of order k , class l , excess h (supposed irreducible), involves $\frac{1}{2}k(k-1) + h$ dps, of which $k-1$ are cusps, and $\frac{1}{2}(l-1) + h$ dls, of which $l-1$ are inflexional tangents. The singularity is equivalent to those components as regards Plücker's equations and as regards the genus; but not in the number of conditions imposed on the curve.

It is obvious that the multiple points of a curve cannot always be chosen arbitrarily. A sextic, e.g., can have 10 dps; but these, chosen arbitrarily, would impose 30 conditions, whereas 27 determine the sextic. The 27 conditions cannot be imposed by 9 dps arbitrarily chosen,

for these would determine only the reducible sextic $v^2=0$, where v is the cubic through the 9. If the 9 admit of a proper sextic, $u=0$, they allow one degree of freedom, for all curves $u+kv^2=0$ satisfy the conditions. Hence the 9 are not arbitrary. The theorems of geometry on a curve, and linear systems of curves, lead to general results of this character, but there are evidently many special theorems as to the position of singularities to be formulated for curves of specified order or class.

By means of a birational transformation, either of the whole plane or of the one curve, it is possible to change any curve into one, in general of different order, with no point-singularities except simple nodes. Let $P, (x, y, z)$ become $P', (x', y', z')$ (represented on a second plane for distinctness), where x', y', z' are given by

$x':y':z' = \phi_1(x, y, z) : \phi_2(x, y, z) : \phi_3(x, y, z)$;
then corresponding to any point P of the first plane II there is one point P' of the second plane II' ; but the converse does not hold. The ∞^3 straight lines of $II', lx'+my'+nz'=0$, correspond to the ∞^3 transformation-curves in II , $l\phi_1 + m\phi_2 + n\phi_3 = 0$, of order σ ; to a single point P' of II' , given as the intersection of two lines, there correspond in II all the κ variable intersections of two ϕ 's, $P_1, P_2, \dots, P_\kappa$; the correspondence of the two planes is said to be " κ -to-one," ($\kappa, 1$). Since the ϕ 's may have fixed points, simple or multiple, A_1, A_2, \dots of orders $\rho_1, \rho_2, \dots, \kappa$ may be less than σ^2 .

If $\kappa=1$, i.e., if one point of II corresponds to one point of II' , the equations of transformation are reversible; not only is II' expressed rationally in terms of II by these equations, but also II is expressed rationally in terms of II' by

$x:y:z = \psi_1(x', y', z') : \psi_2(x', y', z') : \psi_3(x', y', z')$,
the reverted equations, which are of the same order σ . The transformation is a birational transformation of the plane, usually called a Cremona transformation. In the simplest Cremona transformation the ϕ 's are conics through three fixed points; the equations of transformation are therefore of the second degree; this is a reversible quadratic transformation. An important theorem is that every Cremona transformation can be accomplished by a succession of these reversible quadratic transformations.

If $\kappa > 1$, the equations cannot be reverted; the transformation is not birational for the whole plane. But if P_1 trace a curve F , P' traces the corresponding curve F' ; the points P_2, \dots, P_κ trace some curve, f (different from F), the companion curve of F . If we ignore all of II except F , that is, if we confine ourselves to the two curves F, F' , the correspondence becomes one-to-one; with the help of the equation $F=0$ the equations of transformation can be reverted, and the transformation becomes birational. Such a birational transformation of a curve is called a Riemann transformation. Thus a Riemann transformation is birational for the one curve only, while a Cremona transformation is birational for the whole plane, and therefore for every curve in the plane.

The importance of transformation is due to its effect on singularities. The fixed points A_1, A_2, A_3, \dots in II have no correspondents in II' , but a point close to A_i in a determinate direction has a determinate correspondent, and if a point describes a small circuit about A_i , the corresponding point in II' describes a curve a'_i ,

rational and of order ρ_i ; this is a fundamental curve of the second plane. If F passes k times through A_i , F' cuts a_i' in k points; if the k directions through A_i are distinct these points are all separate, and thus the multiple point on F is dissipated. If any of the k tangents at A_i coincide, F' has contact with a_i' , or it may have a multiple point on a_i' but of a less complex character than the original at A_i ; and by repetitions of the process the singularity is made to disappear.

But new singularities may arise, due to fundamental curves in the first plane. Such fundamental curves might be defined by means of the reverted equations of transformation; but as it is not usually convenient actually to form these (at least in the case of a Riemann transformation), it is simpler to adopt an independent definition. An irreducible curve β that meets the transformation curves ϕ only at their fixed points is a fundamental curve of the system; all points on such a curve, β , correspond to a single point B' of $11'$, or, more precisely, to points close to B' in different directions. If then F meets β in h points, F' has at B' a multiple point of order h .

Finally, new multiple points, in general only simple nodes, arise on F' owing to the passage of F through associated points of the first plane (intersections of two ϕ 's). Such passages are indicated by intersections of F with its companion curve f ; hence they are in general inevitable.

By either transformation, Cremona or Riemann, the multiple points on the given curve can be dissipated, whether the tangents are distinct or coincident. A Cremona transformation-system, however, always has fundamental curves, whose number is equal to that of the fundamental points (Bertini, 'Palermo Rendiconti,' v. 3, pp. 5-21, 1889); hence when F is transformed, new multiple points, possibly of high order, will arise unless the Cremona system is specially chosen. A Riemann transformation-system, on the contrary, need not have any fundamental curves, hence in general the new multiple points that arise will be simple nodes. A Riemann transformation, however, requires the elimination of $x : y : z$ from the equations of transformation, of degree σ , together with $F = 0$, of degree m ; whereas a Cremona transformation is accomplished by the direct substitution of $\psi_1(x', y', z')$, $\psi_2(x', y', z')$, $\psi_3(x', y', z')$ for x, y, z . (Salmon, 'Higher Plane Curves,' chap. 8 in the German translation by Fiedler; also references at end; Scott, 'Quart. Jour.' 29, pp. 329-381, 1898; v. 32, pp. 209-239, 1900).

When a curve is subjected to a birational transformation of either kind, Cremona or Riemann, the induced points of a group of intersections transform into the induced points of the transformed group; this affords one proof (Bertini) of the important theorem that two curves which are birationally connected are of the same genus. The converse is not true; curves of the same genus cannot necessarily be birationally transformed into one another. A curve of genus p depends in general on $3(p-1)$ characteristic constants, the so-called moduli; if these are equal for two curves, then the two are birationally equivalent. (Clebsch-Lindemann, 'Vorlesungen über Geometrie,' 1876, pp. 709-720).

Closely connected with this is the trans-

formation of a curve into itself. This however is more conveniently considered as an independent theory, that of correspondence of points on a curve. (Cayley, 'Proc. Lond. Math. Soc.' 1865-66; no. 385, v. 6, Coll. Papers; 'Phil. Trans.,' 1867-68; no. 407, v. 6, Coll. Papers; Brill, 'Math. Ann.,' v. 36, pp. 321-360, 1890; Brill-Noether Bericht, pp. 530-531).

An entirely distinct class of investigations deals with the form of curves (topology, analysis situs). The method employed is usually variation of the coefficients, by which the curve is derived from a known reducible curve of the same order. In this manner Klein proved ('Math. Ann.,' v. 10, pp. 199-209, 1876) that the numbers of the real singularities are connected by the relation

$$m + I + 2T' = n + K + 2A',$$

where I, K, T', A' are the numbers of real inflexions and cusps, isolated tangents and isolated points, on a curve of order m , class n . Hence if the curve has no point-singularities, $I + 2T' = m(m-2)$, from which it follows, since $i = 3m(m-2)$, that not more than one-third of the inflexions of a non-singular locus can be real. Klein's relation has been proved algebraically by Brill ('Math. Ann.,' v. 16, pp. 348-408, 1880), and extended to complex singularities. There is no corresponding restriction on the bitangents; all may be real.

Topological theorems relate in general to the nature, number and arrangement of the distinct parts (circuits) of a curve. The first division of circuits, due to von Staudt, is into odd and even, for the number of real intersections with an arbitrary line is always odd or always even. An odd circuit necessarily extends through infinity. Simple examples are the oval and the infinite branch of a bipartite cubic $y^2 = (x-a)(x-b)(x-c)$; but circuits may be much more complex. Let the minimum number of real intersections with a straight line be called the index of the circuit. Zeuthen showed ('Math. Ann.,' v. 7, p. 426, 1874) that a quartic may have a circuit of index 2, with two nodes; Cayley showed ('Phil. Mag.,' v. 29, 1865; no. 361, v. 5, Coll. Papers) that a sextic may have a circuit of index 2, without multiple points. It has been proved (Scott, 'Trans. Am. Math. Soc.,' v. 3, pp. 388-398, 1902) that for every order m there exists a curve ($p=0$ or 1), composed of a single circuit of index $m-2$, or $m-4$, $m-6$, down to 0 or 1, according as m is even or odd; any such circuit of index k can be produced by a simple process of linking from k odd circuits. The Zeuthen quartic circuit finds its place in this category; it is due to the linking of two odd circuits; but the non-singular sextic circuit is entirely different in character, and a general theory of such circuits is still to be suggested.*

The possible number of circuits is $p+1$. (Harnack, 'Math. Ann.,' v. 10, pp. 189-198, 1876); for every order m there exist curves with this maximum number of circuits, and with every smaller number.

The question of arrangement has been con-

*For connection with symmetric Riemann surfaces consult Klein, 'Math. Ann.' v. 7, pp. 558-566, 1874; v. 10, pp. 415, 416, 1876; über Riemann's Theorie der algebraischen Functionen und ihrer Integrale, 1882; pp. 60-69 in F. Harnack's translation, 'Lectures on Mathematics' The Evanston Colloquium 1894, pp. 30-32; Harkness and Morley, 'Treatise on the Theory of Functions,' pp. 274-276.

sidered only with reference to circuits that can be projected into the finite circuits, the so-called ovals. Hilbert ('Math. Ann.,' v. 38, pp. 115-138, 1891) discussed curves with "nested ovals," whose simplest type is the annular quartic, composed of one oval inside another; the number of nested branches cannot exceed $\frac{1}{2}(m-2)$ or $\frac{1}{2}(m-3)$, according as m is even or odd; moreover, non-singular curves with the maximum number of circuits and the maximum number of nested ovals do exist.

Hilbert draws attention to the arrangement of the 11 ovals of a non-singular sextic ($p=10$); he states that one of these must lie inside another (p. 118). It appears highly probable (V. Ragsdale, 'Bull. Am. Math. Soc.,' v. 11, p. 464, 1905) that this unproved theorem of Hilbert's is the simplest case of a general law in accordance with which at least $\frac{1}{2}(q-1)(q-2)$ of the circuits of a non-singular curve of order $2q$ must lie inside some of the remaining $q^2 + \frac{1}{2}(q-1)(q-2)$.

Thus as regards circuits the only question completely solved is that of the possible number; their nature, their arrangement as regards one another, or as regards the straight lines of the plane (on which depends the answer to the inquiry whether all the even circuits can be projected simultaneously into the finite), have been hardly touched upon, though there must be many interesting results awaiting discovery.

Although the general theory of polars belongs properly to the theory of algebraic forms, it supplies convenient expression for some geometrical facts. The first polar of x', y', z' is the curve of order $m-1$, $\Delta f=0$, where Δ denotes the operator $x' \frac{\partial}{\partial x} + y' \frac{\partial}{\partial y} + z' \frac{\partial}{\partial z}$. A second operation with Δ produces the second polar, $\Delta^2 f=0$, of order $m-2$, and so on; thus any point has $m-1$ polars, of which the last two are the polar conic and polar line. The polar conic of a dp is simply the pair of tangents; the polar conic of an inflexion consists of the inflexional tangent together with another line which does not pass through the inflexion; thus in both cases the polar conic has a dp. It is easily proved that if the polar conic of B has a dp A , the first polar of A has a dp B . This suggests three derived curves: the locus of points A , the Steinerian, of order $3(m-2)^2$; the locus of points B , the Hessian, of order $3(m-2)$; the envelope of the line AB , the Cayleyan. Thus, e.g., the curve by which the points of inflexion are determined, the Hessian, is geometrically defined; every point is in a known geometrical relation to f . On the other hand, though it is known that a curve of order $(m-2)(m^2-9)$ can be passed through the points of contact of the bitangents, no geometrical definition of any such curve has yet been formulated. The curve is of course not unique; what is needed is a geometrical definition of some one curve that shall meet f only at these points of contact, and at the multiple points, in such a manner as to account for the whole number of intersections. (Cayley, 'Coll. Papers,' v. 11, pp. 471, 473).

The metric properties of a curve are important in particular questions, though not in the general theory. The curve has m points at infinity; at each of these there is a tangent, which is an asymptote unless it lies entirely at

infinity. Consequently for every non-repeated direction to infinity there is an asymptote; for a repeated direction there may or may not be asymptotes. A twofold direction, e.g., may be accounted for either by contact with the straight line at infinity, with no asymptote, or by a dp at infinity, with two asymptotes, distinct or coincident. A branch that has a real asymptote is called hyperbolic; a branch that has contact with the straight line at infinity, whether at a single point or at a multiple point, is called parabolic.

The curve has n imaginary tangents from each of the circular points; these by their intersections determine the n^2 foci, of which n are real (Plucker's definition, 1833); but the number of foci is diminished if the curve passes through the circular points or touches the straight line at infinity.

There is a theory of diameters; these are the polars of points at infinity. The polar line of a point at infinity is the locus of the mean centre of the m intersections of the curve with chords through the point (proved by Newton for cubics); this property of a diametral line is analogous to the bisection property of a diameter of a conic. The other polars (curvilinear diameters) also can be explained in terms of the segments of the chords. (Salmon, H. P. C., chap. 4).

The first enumeration of varieties of a curve of any order beyond the second is Newton's 'Enumeratio linearum tertii ordinis' (1706). He proves that all the 72 varieties (it should be 78) can be obtained by projection from the five types of cubic with an inflexional tangent at infinity (divergent parabolas), bipartite, unipartite, crunodal, acnodal and cuspidal. Similarly when once the distinct types of a curve of any order have been enumerated, the varieties can be obtained at once. There are 144 types of quartic (R. Gentry, 'On the forms of plane quartic curves,' 1896); the number for higher curves, even for quintics, must be very great. It does not appear that any special purpose would be served directly by the enumeration of these, though there are matters of interest on which this might throw light. For example, the theory of the inflexional tangents of a cubic has been thoroughly worked out; suitably taken in threes they determine three inflexions on a straight line; the three tangents and this line form a framework for the curve. As regards quartics, a closely corresponding theory is that of the bitangents; suitably taken in fours, these determine sets of eight points on the quartic, each set lying on a conic; the curve is conveniently referred to the four bitangents and the conic. What is the generalization of this? Even for the quintic, this is as yet unknown.

A more profitable classification of curves is according to their genus, and the values of the $3(p-1)$ characteristic constants, or moduli. Rational ($p=0$), elliptic ($p=1$), and hyper-elliptic curves (which include among others all curves with $p=2$) have been extensively treated. (Clebsch-Lindemann, pp. 883-903, 903-915, 915-923; also 711-712, 717-720; Loria, 'Il passato ed il presente delle principali teorie geometriche,' 2d edition, 1896, pp. 76-79 for references).

Investigations on special classes of algebraic

curves are too numerous to mention; in particular, bicircular quartics and cartesian (with nodes, or cusps, at the circular points) have a literature to themselves. The Steiner curve, or deltoid (hypocycloid with three cusps), is perhaps the most interesting individual among algebraic curves, on account of its geometrical properties. (Loria, 'Il passato,' etc., pp. 61-76).

If a curve has an equation that cannot be expressed in finite algebraic form it is said to be transcendental. Algebraic and transcendental curves, however, are by no means as widely separated as this would suggest; e.g., the equation $r = \sin b\theta$ represents curves which are algebraic when b is rational, transcendental for all other values of b . Thus the algebraic curves of the series bear to the whole series the relation that is borne by rational numbers to all numbers; they are isolated members, whose number is insignificant. The same is probably true of all algebraic curves; they are isolated members of transcendental families. It is not surprising, therefore, that there is as yet no general theory of transcendental curves. Results proved for algebraic curves by means of the whole equation (e.g., Plucker's equations) are not applicable to transcendental curves, which from one point of view are of infinite order; while results that depend only on a small arc are in general applicable. Such knowledge as we have of transcendental curves is obtained from metric investigations of special curves.

Among these special curves, one of the most important divisions is that of roulettes. A roulette is traced by a point attached to a curve, which itself rolls without sliding on a fixed curve. A point on the circumference of a circle which rolls on a straight line traces a cycloid; if the circle rolls in or on a circle the roulette is an epicycloid or hypocycloid. If the point is not on the circumference of the rolling circle, the curve is a trochoid, epitrochoid or hypotrochoid. The epicycloid or hypocycloid is algebraic if the radii of the two circles are commensurable. An important theorem, due to Descartes, is that the normal to a roulette at any point passes through the corresponding point of contact of the rolling curve with the fixed curve.

Some of the best known of the transcendental curves are the spiral of Archimedes, $r = a\theta$; the hyperbolic spiral, $r\theta = a$; the logarithmic spiral, $r = a^{\theta}$, which cuts all its radii vectores at a constant angle; the logarithmic curve, $y = a^x$, or $x = m \log y$, which is noteworthy on account of the curious discontinuity of the negative branch (Salmon, H. P. C., chap.

7); the catenary, $y = \frac{c}{2} \left(e^{\frac{x}{c}} + e^{-\frac{x}{c}} \right)$ the form as-

sumed by a chain hanging from two points of support; the tractrix, $x = c \log \frac{c + \sqrt{c^2 - y^2}}{y} - \sqrt{c^2 - y^2}$,

which cuts all the tangents to the catenary orthogonally; this curve is of special interest on account of the use made of it by Beltrami ('Saggio d'interpretazione della geometria non-euclidea,' 1868). (For detailed references consult Loria, 'Spezielle algebraische und transscendente ebene Kurven,' trans. by Schütte, 1902).

All the curves hitherto mentioned have tangents, which vary continuously from point to

point; but there are curves, graphical representations of certain functions, which differ in this respect. A curve may have a tangent at every point, which yet may not vary contin-

uously; e.g., "polygonal lines," $y = \int_0^x f(x) dx$,

where $f(x)$ is a certain arithmetic function; such a curve is composed of a number of segments of straight lines. (Gravé, 'Comptendus,' v. 127, pp. 1005-1007, 1898).

There are curves which are continuous, and yet have no definite tangents; the classic ex-

ample, due to Weierstrass, is $y = \sum_{n=0}^{\infty} b^n \cos a^n x \pi$,

(Wiener, 'Crelle,' v. 90, pp. 221-252, 1881). The explanation of the impossibility of assigning the tangent at any point is that in any finite interval the curve makes an infinity of oscillations.

Another possible deviation from the natural idea of a curve was discovered by Peano ('Math. Ann.,' v. 36, pp. 157-160, 1890). He shows that it is possible to construct functions $\phi(t)$, $\psi(t)$ of a single variable such that the points $x = \phi(t)$, $y = \psi(t)$ occupy all positions inside a given square; thus a curve can cover a plane area. (For detailed discussion of such curves, consult E. H. Moore, 'On Certain Crinkly Curves,' trans., Am. Math. Soc., v. 1, pp. 72-90, 1900).

These examples show clearly that the most general idea of a curve is far removed from the comparatively simple idea first presented in analytical geometry. The definition at present accepted of a plane curve without multiple points, due to Jordan and Hurwitz, has been thus expressed in English (by Osgood): "A set of points which can be referred in a one-to-one manner and continuously to the points of a segment of a right line, inclusive of the extremities of the segment, if the curve is not closed, and to the points of the circumference of a circle if the curve is closed." (Hurwitz, 'Verhandlungen des ersten internationalen Mathematiker-Kongresses in Zürich,' 1897, pp. 102, 103).

CHARLOTTE ANGAS SCOTT,
Professor of Mathematics, Bryn Mawr College.

CURVES OF DOUBLE CURVATURE

(In French, *courbes gauches*; in German, *Curven doppelter Krümmung*). A curve whose points do not all lie in a plane is variously called space curve, twisted curve, tortuous curve or curve of double curvature. The significance of the last-named designation becomes apparent in the description of the elements which enter the theory of the curve. There are two ways of regarding the curve: first, as given immediately and in all its extent by the intersection of two surfaces—a purely geometric conception; second, as arising kinematically through the continuous movement of a point. The first conception leads to the analytical formulation of a curve as the locus of points whose Cartesian co-ordinates satisfy two equations, the equations of the intersecting surfaces

$$(1) \quad f_1(x, y, z) = 0, \quad f_2(x, y, z) = 0.$$

The second conception leads to the expression of the Cartesian co-ordinates x , y , z as func-

tions of a variable magnitude u called the parameter:

$$(2) \quad x = \phi(u), \quad y = \chi(u), \quad z = \psi(u),$$

a form of representation called the parametric representation of the curve. To the continuous succession of values of u corresponds the continuous succession of points of the curve.

It is known that not every curve in space is the complete intersection of two surfaces, and therefore (1) and (2) are not always equivalent forms. In fact, when the three equations (2), defining a curve, are transformed to the two equations (1), the latter often furnish curve branches in addition to the original curve. The parametric representation is, in many important respects, preferable to the first form, and such equations and formulas as are hereafter used will have reference to this form.

The subject matter may be conveniently divided into four parts: first, the determining elements of an infinitely small portion of the curve in the neighborhood of any point P of the curve; second, the character of the curve as a whole and the associated curves and surfaces; third, special curves and their derivation from given properties; fourth, classification, miscellaneous matters and the literature of the subject.

1. The Elements of the Curve at a Point.

—The consideration of two points, of three points and of four points of the curve conducts immediately to fundamental elements.

The *tangent* at P is the limiting position assumed by the right line through P and a neighboring point P_1 of the curve as P_1 moves along the curve toward coincidence with P . It is convenient to say that the tangent at P is the right line through P and P_1 , P_1 being infinitely near or consecutive to P , but it must be remembered that this and similar expressions which will be used further on are only abbreviations and figures of speech.

The single infinity of lines through P perpendicular to the tangent are *normals* to the curve and define the *normal plane* of the curve at P . Every plane through the tangent is a tangent plane at P . A plane passing through P and two neighboring points of the curve assumes in general a limiting position at P as the two neighboring points move along the curve toward coincidence with P . This is the *plane of osculation* at P and may be described as the plane determined by three consecutive points P, P_1, P_2 . It is the tangent plane at P which has the closest contact with the curve.

The plane through the tangent perpendicular to the plane of osculation is called the *plane of rectification* at P . The normal plane, the plane of osculation and the plane of rectification are mutually at right angles and constitute the principal planes of the curve at P . Their intersections are three lines through P : the *tangent*, which is the intersection of the plane of osculation and the plane of rectification; the *principal normal*, which is the intersection of the normal plane and the plane of osculation; the *binormal*, the intersection of the normal plane and the plane of rectification. The three lines form a configuration called the *principal triad* at P .

Of importance in the theory is the *circle of curvature*, namely, the limit circle defined by the fixed point P and two variable points $P_1,$

P_2 as the variable points move along the curve toward coincidence with P . It is referred to as the circle through three consecutive points P, P_1, P_2 and obviously lies in the plane of osculation at P . Its centre, radius and the reciprocal of the radius are called respectively the *centre of curvature*, the *radius of curvature* and the *curvature of the curve* at P . Relative to the name, curve of double curvature, the curvature here described is properly first curvature, but it is customary to omit the word "first". The second curvature, to be noted shortly, is usually referred to as *torsion*.

Four points not in a plane determine one sphere. Through P and three variable points of the curve a sphere may be passed, which, when the variable points come into coincidence with P , becomes the *sphere of osculation* at P . It will be subsequently seen that its centre and the centre of first curvature are on a line parallel to the binormal at P .

The further development of the theory will employ the methods of the differential geometry in preference to limit processes. The elements already defined, when taken in pairs, give rise to new elements. The normal planes at the consecutive points P and P_1 intersect in a line passing through the centre of curvature of P and parallel to the binormal of P . It is called the *axis of curvature* of the curve at P . The planes of rectification at P, P_1 intersect in the *line of rectification* at P . This line passes through P , makes an angle with the binormal of P and is perpendicular to the principal normals of P and P_1 . The planes of osculation at P, P_1 intersect in the tangent of the curve. The principal normals at P and P_1 do not intersect, nor do the binormals of P and P_1 . The consecutive tangents do intersect in a point on the curve.

The Two Curvatures, or Curvature and Torsion.—As a point moves on the curve, the tangent continually changes its direction, as does also the plane of osculation: the first marks the tendency of the curve to depart from a right line, and the second the tendency to depart from a plane. Measures of these tendencies at a point P are defined as follows: If PP_1 be an infinitely small arc of length ds , and $d\epsilon$ the infinitely small angle between the tangents at P and P_1 ; and $d\tau$ the infinitely small angle between the planes of osculation at P and P_1 or, what is the same thing, the angle between the binormals of P and P_1 ; then the ratio $\frac{d\epsilon}{ds}$ is called the

curvature of the curve at P , and the ratio $\frac{d\tau}{ds}$

is called the *torsion of the curve at P* . The angles $d\epsilon$ and $d\tau$ are called respectively *angle of contingence*, and *angle of torsion* at P . This point of view of curvature leads at once to the circle of curvature previously described. The

ratio $\frac{d\epsilon}{ds}$ has the same value for the curve and

the circle at P , and if R designates the radius of the circle, there results *curvature at a point* $= \frac{1}{R} = \frac{d\epsilon}{ds}$. On the other hand, there is no circle

of torsion connected with the curve, and it is only by analogy that the term *radius of*

torsion, T , is defined to be the reciprocal of the *torsion*. Expressed in equational form, *torsion* at a point $= \frac{1}{T} = \frac{dr}{ds}$.

A third curvature is sometimes regarded, but merely as a convenience. It is the limiting ratio of the infinitely small angle $d\kappa$ between the principal normals at P and P_1 to the arc ds . It is in a sense the resultant of the other two curvatures, and has received the name of *entire curvature*. The angle $d\kappa$ is called the *angle of entire curvature*. Entire curvature is not an independent curvature, for, as will shortly be seen, its angle $d\kappa$ is a function of the other two through the equation $d\kappa^2 = d\tau^2 + d\tau^2$.

Before clothing the foregoing definitions in analytical garb, it is necessary to adopt conventions as to the signs of directions and to complete the notation. Of the two directions on a curve, that is taken as positive which corresponds to increasing values of u . The positive direction of the tangent is taken to coincide with the positive direction of the curve, and the direction cosines of the angles the positive tangent makes with the positive directions of the co-ordinate axes x, y, z are designated by $\alpha_1, \beta_1, \gamma_1$, respectively. The positive direction of the principal normal is the direction from P toward the centre of curvature, and its direction cosines are designated by $\alpha_2, \beta_2, \gamma_2$. The positive direction of the binormal is so taken that it is directed with respect to the positive tangent and positive principal normal as the positive z axis is directed to the positive x axis and positive y axis. Its direction cosines are represented by $\alpha_3, \beta_3, \gamma_3$.

A table conveniently exhibits these relations:

	x	y	z
Tangent.	α_1	β_1	γ_1
Principal normal. . . .	α_2	β_2	γ_2
Binormal.	α_3	β_3	γ_3

In the elements of solid analytic geometry, it is shown that the determinant of the nine direction cosines equals 1, i.e. $\begin{vmatrix} \alpha_1 & \beta_1 & \gamma_1 \\ \alpha_2 & \beta_2 & \gamma_2 \\ \alpha_3 & \beta_3 & \gamma_3 \end{vmatrix} = 1$

and that each constituent is equal to its co-factor. For example, $\alpha_1 = \gamma_1\beta_2 - \gamma_2\beta_1$. It is also a theorem of the elements of analytic geometry of space, that if a straight line varies its direction infinitely little, say by an angle $d\omega$, and if l, m, n are the direction cosines of the first position, and $l+d'l, m+dm, n+dn$ are the direction cosines of the second position, that $d\omega^2 = d'l^2 + dm^2 + dn^2$. It has immediate application in the two curvatures.

Taking over from the calculus the value of ds^2 and differentiating,

$$(3) \quad ds^2 = dx^2 + dy^2 + dz^2, \\ ds \, d^2s = dx \, d^2x + dy \, d^2y + dz \, d^2z.$$

The analytical side of the foregoing development is now easily formulated. All equations which follow and which contain the variables x, y, z and their differentials $dx, dy, dz, d^2x, d^2y, d^2z, ds, d^2s$ may be expressed in terms of the parameter u and its differential du by means

of equations (2), the equations resulting from their differentiation, and equations (3).

One has immediately from the definitions of the elements at the point $P(x, y, z; u)$

$$(4) \quad \alpha_1 = \frac{dx}{ds}, \quad \beta_1 = \frac{dy}{ds}, \quad \gamma_1 = \frac{dz}{ds};$$

hence, for the equations of the tangent,

$$(5) \quad \frac{\xi - x}{dx} = \frac{\eta - y}{dy} = \frac{\zeta - z}{dz},$$

and for the normal plane,

$$(6) \quad (\xi - x)dx + (\eta - y)dy + (\zeta - z)dz = 0.$$

The symbols ξ, η, ζ represent here and subsequently the current co-ordinates of the points of line, plane, etc.

In determining the constants L, M, N, Q so that the plane $L\xi + M\eta + N\zeta + Q = 0$ passes through the point x, y, z , and the infinitely near points $x+dx, y+dy, z+dz$, and $x+2dx+d^2x, y+2dy+d^2y, z+2dz+d^2z$, one obtains $(\xi - x)(dy \, d^2z - dz \, d^2y) + (\eta - y)(dz \, d^2x - dx \, d^2z) + (\zeta - z)(dx \, d^2y - dy \, d^2x) = 0$,

or, in putting for convenience

$$(7) \quad A = dy \, d^2z - dz \, d^2y, \quad B = dz \, d^2x - dx \, d^2z, \\ C = dx \, d^2y - dy \, d^2x,$$

the equation of the plane of osculation in the form

$$(8) \quad A(\xi - x) + B(\eta - y) + C(\zeta - z) = 0.$$

This at once gives

$$(9) \quad \alpha_2 = \frac{A}{\sqrt{A^2 + B^2 + C^2}}, \quad \beta_2 = \frac{B}{\sqrt{A^2 + B^2 + C^2}}, \\ \gamma_2 = \frac{C}{\sqrt{A^2 + B^2 + C^2}};$$

and for the equations of the binormal

$$(10) \quad \frac{\xi - x}{A} = \frac{\eta - y}{B} = \frac{\zeta - z}{C}.$$

From the determinant of the direction cosines one has

$$(11') \quad \alpha_2 = \gamma_1\beta_3 - \gamma_3\beta_1, \quad \beta_2 = \alpha_1\gamma_3 - \alpha_3\gamma_1, \\ \gamma_2 = \beta_1\alpha_3 - \beta_3\alpha_1,$$

and hence, by virtue of (4) and (9),

$$(11) \quad \alpha_2 = \frac{Bdz - Cdy}{ds \sqrt{A^2 + B^2 + C^2}}, \quad \beta_2 = \frac{Cdx - Adz}{ds \sqrt{A^2 + B^2 + C^2}}, \\ \gamma_2 = \frac{A dy - B dx}{ds \sqrt{A^2 + B^2 + C^2}}.$$

The equation of the plane of rectification is

$$(12) \quad (\xi - x)\alpha_2 + (\eta - y)\beta_2 + (\zeta - z)\gamma_2 = 0,$$

and the equations of the principal normal are

$$(13) \quad \frac{\xi - x}{\alpha_1} = \frac{\eta - y}{\beta_1} = \frac{\zeta - z}{\gamma_1}.$$

Applying to curvature the theorem relative to the infinitely small change in direction of a right line, one has $d\epsilon^2 = d\alpha_1^2 + d\beta_1^2 + d\gamma_1^2$, whence, in differentiating (4) and employing (3) in the reduction,

$$(14) \quad (\text{curvature})^2 = \frac{1}{R^2} = \frac{d\epsilon^2}{ds^2} = \frac{A^2 + B^2 + C^2}{ds^6},$$

and also

$$(15) \quad d\alpha_1 = \frac{Bdz - Cdy}{ds^2}, \quad d\beta_1 = \frac{Cdx - Adz}{ds^2}, \\ d\gamma_1 = \frac{A dy - B dx}{ds^2}.$$

A comparison of (11), (14) and (15) gives

$$(16) \quad \alpha_s = R \frac{da_1}{ds}, \quad \beta_s = R \frac{d\beta_1}{ds}, \quad \gamma_s = R \frac{d\gamma_1}{ds}.$$

When the arc s is the independent variable, that is, when $u = s$, equations (14) and (16) take simple forms,

$$\frac{1}{R^2} = \frac{d^2x}{ds^2} + \frac{d^2y}{ds^2} + \frac{d^2z}{ds^2};$$

$$\alpha_s = R \frac{d^2x}{ds^2}, \quad \beta_s = R \frac{d^2y}{ds^2}, \quad \gamma_s = R \frac{d^2z}{ds^2}.$$

Applying the same process to torsion $d\tau^2 = da_s^2 + d\beta_s^2 + d\gamma_s^2$, and a differentiation of (9) gives

$$da_s = -\frac{Bdz - Cdy}{\sqrt{A^2 + B^2 + C^2}} \frac{Ad^2x + Bd^2y + Cd^2z}{A^2 + B^2 + C^2},$$

$$(17) \quad d\beta_s = -\frac{Cdx - Adz}{\sqrt{A^2 + B^2 + C^2}} \frac{Ad^2x + Bd^2y + Cd^2z}{A^2 + B^2 + C^2},$$

$$d\gamma_s = -\frac{Ady - Bdx}{\sqrt{A^2 + B^2 + C^2}} \frac{Ad^2x + Bd^2y + Cd^2z}{A^2 + B^2 + C^2},$$

whence

$$(18) \quad \text{torsion} = \frac{1}{T} = \frac{d\tau}{ds} = -\frac{Ad^2x + Bd^2y + Cd^2z}{A^2 + B^2 + C^2}.$$

The radical $\sqrt{A^2 + B^2 + C^2}$ is to be taken throughout with positive sign. The numerator in the value of torsion, written in the form

of a determinant, is $\begin{vmatrix} dx & dy & dz \\ d^2x & d^2y & d^2z \\ d^3x & d^3y & d^3z \end{vmatrix}$, and its evanish-

ment for all values of u is the necessary and sufficient condition that the space curve is in reality a plane curve. If it vanishes only for isolated values of u , the planes of osculation at the corresponding points are *stationary*, that is, the plane of osculation does not tend to change in passing to the consecutive point. Curvature and therefore R are always taken positive. This, however, is not the case with torsion; its sign may be positive or negative and is determined without ambiguity in the foregoing equation. A space curve is said to have a right (left) twist at P if it appears to an observer, standing at P on the plane of osculation (either side) and looking in the direction of the centre of curvature, to rise from left (right) to right (left) through P . The above formula, with this definition of twist, associates right twist with positive torsion and left twist with negative torsion.

The Frenet Equations.—These are nine very important equations in which the quotients of the differentials of the direction cosines of the lines of the principal triad divided by ds , are expressed in terms of the direction cosines and R and T . Six of these equations are already at hand: from (16)

$$(19) \quad \frac{da_1}{ds} = \frac{\alpha_s}{R}, \quad \frac{d\beta_1}{ds} = \frac{\beta_s}{R}, \quad \frac{d\gamma_1}{ds} = \frac{\gamma_s}{R};$$

from (11), (17) and (18)

$$(20) \quad \frac{da_s}{ds} = \frac{\alpha_s}{T}, \quad \frac{d\beta_s}{ds} = \frac{\beta_s}{T}, \quad \frac{d\gamma_s}{ds} = \frac{\gamma_s}{T};$$

from (11') by differentiation, with substitutions from (19) and (20),

$$(21) \quad \frac{d\alpha_s}{ds} = -\frac{\alpha_s}{R} - \frac{\alpha_s}{T}, \quad \frac{d\beta_s}{ds} = -\frac{\beta_s}{R} - \frac{\beta_s}{T},$$

$$\frac{d\gamma_s}{ds} = -\frac{\gamma_s}{R} - \frac{\gamma_s}{T}.$$

The equations were also given later by Serret and are sometimes called by his name. They are particularly used in the differentiation of equations, and are of importance in questions relating to the determination of curves with assigned properties.

2. The Curve and Its Associated Curves and Surfaces.—There are four ruled surfaces on which the space curve lies and a fifth ruled surface on which it does not lie, to all of which surfaces it sustains special relations. The tangents at all the points of the curve constitute the *tangential surface* of the curve. This surface consists of two sheets with the space curve as a sharp edge. A normal plane at P intersects the two sheets of the surface in a curve which has P as a cusp point. The space curve is the locus of intersections of consecutive tangents and is called the *edge of regression* of the tangential surface. The surface is a developable surface,¹ namely, one which could be supposed laid down in a plane without stretching. To the space curve there is an infinity of involutes all lying in the tangential surface. One may imagine a string stretched on the curve and so unwound that the part continually being freed from the curve remains tangent to the curve, each point of the string will describe an involute on the tangential surface to which the space curve is an evolute.

The locus of the binormals of the curve is called the *surface of the binormals*. It is a non-developable or skew surface.¹ The infinitely small arc element is perpendicular to the binormals at its extremities, whence it follows that the space curve is the *line of striction*¹ of its binormal surface.

The locus of the principal normals is a skew surface and is called the *surface of the principal normals*. The space curve is an orthogonal trajectory of the right lines of the surface and is also an asymptotic¹ line of the surface. This latter property follows from the fact that the planes of osculation of the curve are tangent planes to the surface at the points of the curve.

The locus of the lines of rectification is a developable surface and is called the *surface of rectification* of the curve. It owes its name to the circumstance that when it is developed in a plane, the space curve is transformed into a straight line. From this it follows that a space curve is a geodesic¹ on its surface of rectification. That the space curve passes into a straight line when the surface of rectification is developed in a plane is readily established from the Frenet equations (21). The angle between two consecutive planes of rectification, $d\kappa$, vanishes in the development of the surface, or $d\kappa^2 = da_s^2 + d\beta_s^2 + d\gamma_s^2 = 0$. Writing (21) in the form $da_s = -\alpha ds - \alpha d\tau$, $d\beta_s = -\beta ds - \beta d\tau$, $d\gamma_s = -\gamma ds - \gamma d\tau$, squaring and adding, there results $d\kappa^2 + d\tau^2 = 0$, or $d\kappa = 0$, $d\tau = 0$. As the angle of contingence is zero, the consecutive tangents of the developed curve coincide, and the curve is a straight line.

The fifth ruled surface is the locus of the axes of curvature. It is a developable surface, not containing the curve, but containing the curve of centres of curvature and also the curve of centres of the osculating spheres. The surface bears the name of *polar surface*, or *evolute surface*. The axis of curvature is sometimes called polar axis and hence the name polar surface. To the space curve as an involute there

is an infinity of evolute curves all lying on the polar surface, and hence the name evolute surface. If one imagined a string stretched freely on the polar surface with one extremity at P of the space curve, the part of the string on the surface would lie in one of the evolutes of the space curve. Further, if two strings were supposed joined at P , each lying on an evolute, and the two strings then unwound from the polar surface, the point P would describe the space curve, and the angle between the strings at P would remain constant in the motion. The polar surface is the common surface of rectification of all the evolutes, and these curves are, accordingly, geodesics of the surface.

The curve of centres of curvature is the intersection of the polar surface and the principal normal surface. Its equations are

$$(22) \quad \xi = x + R\alpha, \eta = y + R\beta, \zeta = z + R\gamma.$$

Those of the axis of curvature are

$$\begin{aligned} \xi &= x + R\alpha + v\alpha, \eta = y + R\beta + v\beta, \\ \zeta &= z + R\gamma + v\gamma, \end{aligned}$$

for u constant and v variable. If u is regarded as variable as well as v , the equations define the polar surface. Two consecutive axes of curvature, say the axes of P and P_1 , intersect in a point of the edge of regression of the surface, but the point as a point on the first axis is equidistant from P, P_1, P_2 , and as lying on the second axis is equidistant from P_1, P_2, P_3 , and is therefore equidistant from P, P_1, P_2, P_3 , or is the centre of the osculating sphere at P . The edge of regression of the polar surface is the locus of the centres of the osculating spheres of the space curve. Analytically treated the problem gives for the equations of the locus of centres of the osculating spheres:

$$(23) \quad \xi = x + R\alpha - \frac{dR}{d\tau}\alpha, \eta = y + R\beta - \frac{dR}{d\tau}\beta, \\ \zeta = z + R\gamma - \frac{dR}{d\tau}\gamma,$$

and for the radius, r , of the sphere

$$(24) \quad r^2 = R^2 + \left(\frac{dR}{d\tau}\right)^2.$$

There is a complete reciprocity between a space curve and the edge of regression of its polar surface when, and only when, the space curve is a curve of constant curvature, i.e., $R = \text{constant}$. Equations (23) reduce to (22), showing that the curve on the polar surface becomes the locus of the centres of curvature of the space curve. Some of the relations between the two curves when $R = \text{constant}$ are here stated: Each is the locus of the centres of curvature of the other with the same constant curvature; the tangent of the one is the axis of curvature of the other; the corresponding plane of osculation of the one is the normal plane of the other; corresponding planes of rectification are parallel; angle of contingence of the one equals angle of torsion of the other. The last two properties hold also when R is not constant.

If a space curve is spherical, its polar surface will be a cone with vertex at the centre of the sphere, and the polar edge of regression reduces to a point, the centre of the sphere. ξ, η, ζ , are, accordingly, constants for all values of u , and their differentials are zero. The differen-

tiation furnishes $Rd\tau + d\left(\frac{dR}{d\tau}\right) = 0$ as the neces-

sary and sufficient condition for a spherical curve.

Spherical Depiction.—Each point of the space curve is co-ordinated with a point on the surface of a unit sphere in a definite manner. Assume a sphere of radius one with centre at the origin of axes, and draw a radius to a point p of the surface parallel to the positive direction of the tangent at the point P of the curve. The point p is the spherical image or picture of P with respect to the tangent, and the picture of all the points of the space curve is a curve called the *spherical indicatrix of the space curve with respect to the tangent*. Similarly, there are spherical images with respect to the principal normal, binormal, etc. Such depictions lead to problems concerning the determination of curves with given spherical images.

Intrinsic Equations.—A space curve is completely determined as to its form, though not as to its position in space, when curvature and torsion are given in terms of the arc s of the curve. Two equations of this character are called the intrinsic equations of the curve. To pass from the intrinsic equations $R = f(s)$, $T = g(s)$ to the parameter representation requires the integration of a differential equation of the Riccati form. A discussion of the problem is given in Darboux, Vol. I, and in Scheffer, Vol. I (see paragraph on literature of subject). Curvature and torsion do not change in value when the curve is moved about in space, nor do the successive derivatives of curvature and torsion with respect to s change in value. These quantities and all functions of them are called differential invariants with respect to all movements of the curve in space.

3. *Special Curves.*—The curve of constant curvature, $\frac{1}{R} = \text{constant}$, has already been

spoken of. It is obvious that in the development of the tangential surface in a plane, the curve transforms into a circle. Any curve of this class of radius of curvature R is given by the equations

$$x = R \int \lambda d\theta, y = R \int \mu d\theta, z = R \int \nu d\theta,$$

in which λ, μ, ν are any three functions of θ that satisfy the two equations,

$$(25) \quad \lambda^2 + \mu^2 + \nu^2 = 1, \left(\frac{d\lambda}{d\theta}\right)^2 + \left(\frac{d\mu}{d\theta}\right)^2 + \left(\frac{d\nu}{d\theta}\right)^2 = 1.$$

Direct differentiation of the equations of the curve will show that $\lambda = \alpha, \mu = \beta, \nu = \gamma$, and $d\theta = d\tau$.

The curve of constant torsion $\frac{1}{T} = \text{constant}$ is defined by the equations

$$\begin{aligned} x &= T \int \left(\mu \frac{d\nu}{d\theta} - \nu \frac{d\mu}{d\theta}\right) d\theta, y = T \int \left(\nu \frac{d\lambda}{d\theta} - \lambda \frac{d\nu}{d\theta}\right) d\theta, \\ z &= T \int \left(\lambda \frac{d\mu}{d\theta} - \mu \frac{d\lambda}{d\theta}\right) d\theta, \end{aligned}$$

where λ, μ, ν are functions of θ satisfying the conditions (25). Again, direct differentiation of the equations shows $\lambda = \alpha, \mu = \beta, \nu = \gamma$, and $d\theta = d\tau$. Examples of curves of constant torsion are furnished by the asymptotic curves of surfaces of constant negative (Gauss) curvature.¹ This theorem was established by Enneper, *Göttinger Nachrichten*, 1870.

The curves in which the ratio of curvature and torsion is constant, $\frac{T}{R} = \text{constant}$, are helices,

namely, curves on cylindrical surfaces that intersect all the right-line generators of the surface under a constant angle. Such a curve is a general helix. When, however, both curvature and torsion are constant, the curve becomes the ordinary helix, i. e., the helix on a right circular cylinder. A helix passes into a straight line when the cylindrical surface is developed in a plane. The cylindrical surface is its surface of rectification, and the right-line generators are the lines of rectification. The helix is, accordingly, a geodesic of the cylindrical surface, and this property itself could be taken as the definition of a helix. The principal normals are all parallel to a plane perpendicular to the generators of the cylindrical surface. The original sources on the subject of the helix are Puiseux, *Journ. de Math.* (Vol. VII, 1842); Bertrand, *Journ. de Math.* (Vol. XIII, 1848).

Bertrand found that if a curve is of such a character that there exists between its curvature and torsion a linear relation with constant

coefficients, $\frac{a}{R} + \frac{b}{T} = 1$, there is one, and only

one, other curve which has the same principal normals as the first. The length on a principal normal between corresponding points of the curves is constant. The associated curves are called Bertrand curves. The theorem suffers exception when the curvature and torsion are both constant, namely, in the case of the ordinary helix. Here there is an infinity of Bertrand curves, all helices on the common principal normal surface. Bertrand, *Journ. de Math.* (Vol. XV, 1850); J. A. Serret, *Journ. de Math.* (Vol. XVI, 1851).

The ordinary helix holds, relative to space curves, a position somewhat similar to that held by a circle relative to plane curves. The circle is the curve of constant curvature (torsion = 0), and the ordinary helix is the curve of constant curvature and constant torsion. At a point of a plane curve, one circle may be passed having contact of the second order with the curve, or, as one may say, the circle and curve have three consecutive points in common, and, in general, no more than three points. It is the circle of osculation of the curve. Through three consecutive points, P, P_1, P_2 , of a space curve a single infinity of ordinary helices may be passed, but in general they will not have more than the three points in common with the curve. All elements that depend on three consecutive points are common elements of the curves, viz., tangent, plane of osculation, principal normal, circle of curvature, at P . Among the helices is one whose principal normal at P_1 coincides with the principal normal of the space curve at the same point. This helix has the same torsion and curvature as the space curve at P , and is called the osculating helix of the space curve at the point P .

The length of a finite portion of a curve defined by equations (2) rests upon the evaluation of a definite integral. If on the arc lying between M and P points are marked in succession proceeding from M toward P , viz., $M, Q_1, Q_2, \dots, Q_{n-1}, P$, and the chords MQ_1, Q_1Q_2, \dots are drawn, there will be formed an

inscribed polygon, the length of which will vary with the number of inscribed points and their position. But if the number of sides of the polygon be indefinitely increased, and each side be indefinitely diminished, the length of the polygon will approach a definite limiting value. This definite limiting value is defined to be the arc length from M to P . If M corresponds to the parameter value $u = u_0$, and P to the general value u , the arc length s is the definite integral

$$s = \int_{u_0}^u \sqrt{\left(\frac{dx}{du}\right)^2 + \left(\frac{dy}{du}\right)^2 + \left(\frac{dz}{du}\right)^2} du.$$

Whence by differentiation the linear element of arc is

$$ds^2 = \left[\left(\frac{du}{dx}\right)^2 + \left(\frac{dy}{du}\right)^2 + \left(\frac{dz}{du}\right)^2\right] du^2 = dx^2 + dy^2 + dz^2$$

The foregoing theory of the space curve contains implicitly the assumption that the arc element ds is not zero; an assumption which holds for all real curves. In dropping the condition that ds may not be zero, one is led to certain imaginary curves defined by the differential equation

$$\left(\frac{dx}{du}\right)^2 + \left(\frac{dy}{du}\right)^2 + \left(\frac{dz}{du}\right)^2 = 0.$$

These curves are called minimal curves and are either minimal right lines or minimal twisted curves with tangents that are minimal right lines. The right lines

$$x = a_1 + b_1 u, \quad y = a_2 + b_2 u, \quad z = a_3 + b_3 u$$

satisfy the above differential equation when $b_1^2 + b_2^2 + b_3^2 = 0$.

The values of the constants b_1, b_2, b_3 , taken subject to this condition, furnish a single infinity of minimal right lines lying on an imaginary cone with vertices at the points (a_1, a_2, a_3) . The intersection of the cone by the plane of infinity is the imaginary circle at infinity. The minimal lines through any point of space are the lines joining the point to the points of the imaginary circle at infinity. The twisted minimal curves are all represented by the equations

$$x = \frac{1}{2}(1 - u^2)f''(u) + uf'(u) - f(u),$$

$$y = \frac{i}{2}(1 + u^2)f''(u) - iuf'(u) + if(u),$$

$$z = uf''(u) - f'(u).$$

The accents indicate differentiation with respect to u ; $i = \sqrt{-1}$; and $f(u)$ is a function of the complex imaginary variable u . $f(u)$ is restricted only in that its third derivative must not be zero. Elements of the curve which do not essentially rest on ds can be obtained in the usual way, viz., tangent, plane of osculation, etc. As the plane of osculation contains two consecutive tangents, it touches the imaginary circle at infinity. The tangential surface of the minimal curve accordingly circumscribes the circle at infinity. Inversely, a minimal curve can be defined as the edge of regression of a developable surface circumscribing the imaginary circle at infinity. The introduction of the minimal right lines and the imaginary circle at infinity enables one to express certain metric relations in projective form. The minimal curves find very elegant application in the theory of minimal surfaces (real). See SURFACES, THEORY OF.

The point P , to which all the developments have been attached, is supposed to be an ordinary point of the curve. A point is ordinary when this point and points on the curve in its immediate vicinity can be represented by the same three equations of form (2), each point corresponding to a single value of u . The three functions $\phi(u)$, $\chi(u)$, $\psi(u)$ must be developable in power series at the point, and the three first derivatives must not be simultaneously zero. As an example of a singularity, it is obvious that these conditions are not satisfied by a point at which the curve intersects itself. The singularities of a twisted curve are discussed in Arthur Cayley's *Collected Mathematical Papers* (vol. 1, Cambridge, England, 1889).

Classification.—Curves are divided into algebraic and transcendental curves, depending on whether their equations are or are not algebraic. The order of a space curve is the number of points of intersection (real or imaginary) of the space curve by an arbitrary plane. The rank of the curve is the number of tangents intersected by an arbitrary straight line—that is, it is the order of the tangential surface of the curve. The class of the curve is the number of planes of osculation that pass through an arbitrary point of space.

There is no known system of elements which suffice to characterize the general space curve. There is no proper curve of the second order; there is one family of curves of the third order; there are two families of curves of the fourth order, a fact which puts in evidence that the order of a curve does not in itself suffice to characterize space curves. When to order is added the number of apparent double points, namely, the number of chords which can be drawn through an arbitrary point of space, a differentiation is effected, but this again fails in the case of curves of the ninth order. Cayley (*Collected Mathematical Papers*, vol. 1, p. 207) established formulas for the space curve corresponding to the Plucker formula for plane curves.

JAMES MACLAY.

CURVILINEAR PERIOD. See DECORATED STYLE.

CURWEN, kŭr'wĕn, John, English clergyman and musical educator: b. Heckmondwike, Yorkshire, England, Nov. 14, 1816; d. Heaton Mersey, near Manchester, May 26, 1880. After studying for the Independent ministry at Wymondley College, he served as assistant minister at Basingstoke (1838–1841) and Stowmarket (1841–1844). In 1844 he became pastor of a chapel at Plaistow, Essex, a charge he held until 1864, when he resigned to devote himself exclusively to music. The problems of teaching music to Sunday school pupils had attracted him to the tonic sol-fa system of instruction (see SOL-FA, TONIC SOL-FA, OR MOVABLE DOH SYSTEM) developed by Sarah Ann Glover (1785–1867). This he adopted and publicized in his *Grammar of Vocal Music* (1843). In 1853 he established the Tonic Sol-fa Association, and in 1863 the music publishing firm of J. Curwen & Sons, Ltd. The Tonic Sol-fa College, chartered in 1875, was opened in 1879. Curwen lectured widely on musical education and published a number of books, including *Child's Own Hymn Book* (1841); *How to Observe Harmony* (1861); *New Standard Course on the Tonic Sol-fa*

Method (1872); *Musical Statics* (1874); and *Musical Theory* (1879).

His son, JOHN SPENCER CURWEN (1847–1916), was also a musical educator. In 1880 he became principal of the Tonic Sol-fa College, and two years later founded the Stratford Festival. His published works include *Studies in Worship-Music* (1880) and *Memorials of John Curwen* (1882).

CURWENSVILLE, kŭr'wĕnz-vĭl, borough, Pennsylvania, situated in Clearfield County, at an altitude of 1,165 feet, on the West Branch of the Susquehanna River at its confluence with Anderson Creek, 16 miles east-southeast of Du Bois. There is freight service via the Baltimore & Ohio and Pennsylvania railroads. First settled in 1812, the borough has establishments producing firebrick, clay, stone, leather, hosiery, and shirts. Pop. (1950) 3,332.

CURWOOD, kŭr'wōd, James Oliver, American novelist: b. Owosso, Mich., June 12, 1878; d. there, Aug. 13, 1927. After studying at the University of Michigan (1898–1900), he became a reporter and later editor of the *Detroit News-Tribune*. Retiring from journalism in 1907 to devote himself exclusively to writing, he returned to Owosso, where he made his home for the rest of his life. An ardent outdoorsman and conservationist, he traveled widely in the American Northwest, which furnished the setting for most of his novels. These are popular tales of adventure, many of which have been adapted for motion pictures. In all, Curwood published 26 books, including *The Courage of Captain Plum* (1909); *The Honor of the Big Snows* (1911); *Philip Steele, of the Royal Mounted* (1911); *Flower of the North* (1912); *Kazan* (1914); *God's Country and the Woman* (1915); *The Grizzly King* (1916); *Barce, Son of Kazan* (1917); *Nomads of the North* (1919); *The River's End* (1919); *The Valley of Silent Men* (1920); *The Alaskan* (1923); *A Gentleman of Courage* (1924); *The Ancient Highway* (1925); and *The Black Hunter* (1926).

CURYTIBA. See CURITIBA.

CURZON, kŭr'z'n, George Nathaniel, 1st BARON and 1st MARQUESS CURZON OF KEDLESTON, English statesman: b. Kedleston, Derbyshire, England, Jan. 11, 1859; d. London, March 20, 1925. Son of the 4th Baron Scarsdale, he was educated at Eton and at Balliol College, Oxford, from which he was graduated in 1882. In the following year he became a fellow of All Souls College. In 1885, when the 3d marquess of Salisbury became prime minister, the young man was appointed his private secretary. Elected to Parliament in 1886 from the Southport division of Lancashire, Curzon served until 1898. Meanwhile, from 1887 to 1894, he traveled widely in Europe, North America, and Asia. He was undersecretary of state for India in 1891–1892, and undersecretary of state for foreign affairs from 1895 to 1898. In that year he was appointed viceroy and governor general of India and created Baron Curzon of Kedleston (in the Irish peerage, so that he might be eligible to sit in the House of Commons during his father's lifetime).

His term of office in India, which began in 1899, was characterized by a series of notable administrative and financial reforms. The North-

West Frontier Province was created, a treaty was concluded with Hyderabad, and a mission was sent to Tibet. Curzon's partition of Bengal into two provinces was highly unpopular with the Indians, however, and he came into conflict with the 1st Earl Kitchener, who was then commander in chief in India, on a question affecting the civil control of military affairs. Since the British government supported Kitchener, Curzon resigned in 1905 and returned to England. For the next decade he held no political office. In 1907 he was elected chancellor of Oxford University, where he introduced a number of reforms, and in the following year became lord rector of Glasgow University and a member of the British Academy. He entered the House of Lords as an Irish representative peer in 1908, and was created an earl in 1911. From 1911 to 1914 he served as president of the Royal Geographical Society.

In 1915, Curzon joined Herbert Asquith's coalition cabinet as lord privy seal, and in the following year became president of the air board. He remained in the government after David Lloyd George became prime minister in 1916, serving as one of the four members composing the war cabinet. From 1916 to 1924 he was leader of the House of Lords. Appointed secretary of state for foreign affairs in 1919, he remained subordinate to Lloyd George, who controlled all foreign policy decisions. When Bonar Law became prime minister in 1922, however, Curzon obtained a freer hand. He successfully presided over the Lausanne Conference of 1922-1923, and paved the way for the future adjustment of German reparations. He was created a marquess in 1921.

Curzon was a man of great brilliance, but, in part because of lifelong ill health, was often irritable and difficult to deal with. Although he held many major offices, he never achieved his ambition of becoming prime minister. His interests were wide, and he was the author of a number of books, including *Russia in Central Asia* (1889); *Persia and the Persian Question* (1892); *Problems of the Far East* (1894); *Lord Curzon in India* (1906); *Principles and Methods of University Reform* (1909); *Modern Parliamentary Eloquence* (1913); *War Poems and Other Translations* (1915); *Subjects of the Day* (1915); *Tales of Travel* (1923); and *Leaves from a Viceroy's Note-Book, and Other Papers* (1926).

Consult Dundas, L. J. L., 2d marquess of Zetland, *The Life of Lord Curzon*, 3 vols. (New York 1928); Nicolson, H. G., *Curzon: The Last Phase, 1919-1925* (New York 1934).

CURZON LINE, the name given to a suggested boundary line between Soviet Russia and Poland. On Dec. 8, 1919, Lord Curzon proposed to the Supreme Council of the Paris Conference that the dividing line between the two countries be drawn primarily on ethnic lines, the areas of predominantly Polish population falling to the west of the boundary and those of non-Polish population to the east. The line was to run from the southern tip of Lithuania south to the Bug River near Brest, continue southward along the Bug, turn west near Sokal, and then southwest to the northern border of Czechoslovakia. The proposal proved unsatisfactory to both nations, and by the Treaty of Riga (1921) the Polish frontier was drawn 120 to 160 miles east of the Curzon Line.

The line was used in part when Poland was

partitioned between Germany and the USSR in 1939. With some modifications in favor of Poland, it formed the basis of agreement on the eastern Polish frontier at the Yalta and Potsdam conferences in 1945. See also *POLAND—History*.

CUSCATLAN, kōōs-kā-tlān', department, El Salvador, situated in the central part of the country, bounded on the north and northeast by the Department of Chalatenango, on the east by Cabañas, on the southeast by San Vicente, on the south by La Paz, and on the west by San Salvador. It has an area of 672 square miles. The greater part of the terrain is mountainous, but in the valleys and in the north near the Lempa River sugarcane, coffee, cotton, and grain are grown. The only towns of importance are Cojutepeque (the capital) and Suchitoto. Part of Lake Ilopango is included in Cuscatlán.

The department was founded in 1835 and originally covered 1,078 square miles, including until 1855 Chalatenango, and until 1875 part of Cabañas. Pop. (1950) 90,099.

CUSCO. See *Cuzco*.

CUSCUS, kūs'kūs, the name given to any member of a genus (*Phalanger*) of marsupials of the family Phalangeridae or phalangiers (q.v.), native to Celebes, the Moluccas, Timor, New Guinea, the Solomon Islands, and northeastern Australia. Most of the seven species are about the size of a house cat; they have a small head, large eyes, and a dense coat of fur that is extremely variable in color. All forms appear to feed chiefly on leaves and fruit as well as on birds and other small animals. Frequenting forests, they live in trees, swinging from one branch to another by means of their feet and prehensile tails. The most widespread species, the gray cuscus (*Ph. orientalis*), has an interesting geographical distribution. It reaches many small tropical islands in the Australian region and is the only marsupial occurring in Timor and the Solomon Islands.

CUSCUTACEAE. See *DODDER*.

CUSH or **KUSH**, kūsh, in the Old Testament, the name of (1) the eldest son of Ham (Genesis 10:6) and of (2) a country, the ancient Ethiopia (q.v.). Some Biblical scholars believe that the Cush described as the brother of Mizraim and the Cush mentioned as the father of Nimrod in Genesis 10 are two different persons, and that the second Cush probably has reference to the Cossaeans or Kassites (q.v.) of Babylonia.

The country of Cush extended south "from the tower of Syene" (Ezekiel 29:10)—that is, from the first cataract of the Nile in Upper Egypt—and included what is now the Anglo-Egyptian Sudan and part of modern Ethiopia. It may also have extended to eastern and southern Arabia.

CUSHING, kōōsh'ing, **Caleb**, American lawyer and diplomat: b. Salisbury, Mass., Jan. 17, 1800; d. Newburyport, Mass., Jan. 2, 1879. He was graduated from Harvard College at the age of 17, studied at Harvard Law School for a year and then in a law office until 1821, when he was admitted to the bar. Within a few years he acquired an extensive practice in Newburyport. He contributed to the *North American Review* and to *THE ENCYCLOPEDIA AMERICANA*, and edited

the local newspaper. In 1824 he was elected to the Massachusetts General Court. Subsequently he also served as a state senator and as mayor of Newburyport, whose leading citizen he was for 50 years. From 1835 to 1843 he was member of the United States House of Representatives. Elected as a Whig, he broke with the party in 1841 to support President John Tyler and became a Democrat. In Congress he opposed slavery but considered the preservation of the Union of first importance. In 1843 he was appointed United States commissioner to China, charged with the responsibility of negotiating a commercial treaty. Arriving in China in 1844, he negotiated the favorable Treaty of Wanghia, opening five Chinese ports to United States trade; the treaty was ratified in 1845. During the Mexican War, in 1847, he organized a regiment at a personal expense of over \$12,000 and was chosen its colonel. He was soon promoted to the rank of brigadier general, but saw no action. During his absence in Mexico, he had been nominated as Democratic candidate for governor of Massachusetts, but was defeated by the Whig nominee, George N. Briggs, and Briggs defeated him again in the gubernatorial election of 1848. In 1852 he served briefly as associate justice of the Supreme Judiciary Court of Massachusetts. Later that year he helped secure the nomination of Franklin Pierce for the presidency at the Democratic convention in Baltimore. Upon his election, Pierce appointed Cushing attorney general of the United States, and he served in this capacity until 1857.

In 1860, as permanent chairman of the Democratic conventions at Charleston and Baltimore, Cushing supported the candidacy of John Cabell Breckinridge against that of Stephen A. Douglas. After the outbreak of the Civil War he changed his party allegiance once more, becoming a Republican, and was employed by President Abraham Lincoln on a number of confidential missions. After the war he served as chairman (1866-1870) of a commission to revise and codify United States statutes. Meanwhile, in 1868, he went to Bogotá, Colombia, to negotiate a treaty on the right of way for an isthmian canal. In 1872 he served as senior United States counsel before the arbitration tribunal in Geneva, Switzerland, which settled the *Alabama* claims (q.v.). He was appointed minister to Spain in 1873, but before he left for his new post he was nominated chief justice of the United States. Political enemies blocked confirmation of his appointment in the Senate, and Cushing asked President Ulysses S. Grant to withdraw it. He then went to Spain, where he served as United States minister from 1874 to 1877.

Cushing was an excellent lawyer, an accomplished linguist, and a scholar. His published works include *History of Newburyport* (1826); *Review Historical and Political of the Late Revolution in France*; *Reminiscences of Spain* (1833); and *The Treaty of Washington* (1873).

Consult Fuess, C. M., *The Life of Caleb Cushing*, 2 vols. (New York 1923).

CUSHING, Frank Hamilton, American ethnologist: b. North East, Pa., July 22, 1857; d. Washington, D.C., April 10, 1900. He attended Cornell University, and in 1879 became connected with the Bureau of American Ethnology, with which he remained until his death. He lived for five years among the Zuni Pueblo Indians, of whom he made a painstaking study, and

he also investigated pueblos in Arizona and remains at Key Marco, Fla. His published works include *The Nation of the Willows* (1882); *Adventures in Zuni* (1883); *Zuni Creation Myths* (1896); *Zuni Folk Tales* (1901); and *Zuni Breadstuff* (republished, 1920).

CUSHING, Harvey (Williams), American surgeon: b. Cleveland, Ohio, April 8, 1869; d. New Haven, Conn., Oct. 7, 1939. He was educated at Yale (B.A., 1891) and Harvard (M.A. and M.D., 1895) universities, and practiced medicine in Cleveland until 1902, when he became associate professor of surgery at Johns Hopkins University. From 1912 to 1932 he was professor of surgery at Harvard and surgeon in chief at the Peter Bent Brigham Hospital, Boston. After a year's retirement he served as Sterling professor of neurology (1933-1937) and advisory director of studies in medical history (1937-1939) at Yale. During World War I he was director of United States Base Hospital No. 5, attached to the British Expeditionary Force in France (1917-1919), and senior consultant in neurological surgery to the American Expeditionary Force (1918).

The foremost brain surgeon of his time, Cushing achieved an international reputation. Early in his career he advised the use of X-rays, and he introduced blood-pressure determinations in the United States. He made a special study of the pituitary gland, developed the use of local anesthesia in operations, and devised many new techniques. He received honorary degrees from five universities in the United States and nine in other countries. Among his published works are *The Pituitary Body and Its Disorders* (1912); *Tumors of the Nervus Acusticus* (1917); *The Life of Sir William Osler* (2 vols., 1925), for which he received the Pulitzer Prize; *Consecratio Medici, and Other Papers* (1928); *Intracranial Tumours* (1932); *From a Surgeon's Journal, 1915-1918* (1936); and *Meningiomas: Their Classification, Regional Behavior, Life History, and Surgical End Results*, with Louise Eisenhardt (1938).

Consult Fulton, J. F., *Harvey Cushing: A Biography* (Springfield, Ill., 1946); Thomson, E. H., *Harvey Cushing: Surgeon, Author, Artist* (New York 1950).

CUSHING, Luther Stearns, American jurist: b. Lunenburg, Mass., June 22, 1803; d. Boston, Mass., June 22, 1856. He was educated at Harvard (LL.B., 1826) and for some years, with Charles Sumner and George S. Hilliard, edited the *American Jurist and Law Magazine*. From 1832 to 1844 he served as clerk of the Massachusetts House of Representatives. Elected to that body in 1844, he soon resigned to become judge of the court of common pleas in Boston, where he served until 1848. From then until his death he was official reporter of the decisions of the Massachusetts Supreme Court. In addition, he was lecturer on Roman law at Harvard (1848-1849; 1850-1851). Cushing is best known for *A Manual of Parliamentary Practice: Rules of Proceeding and Debate in Deliberative Assemblies* (1844), which is generally known as *Cushing's Manual* and, in a revised edition, is still in use. Among his other works are *A Practical Treatise on the Trustee Process* (1853); *An Introduction to the Study of Roman Law* (1854); *Lex Parliamentaria Americana* or *Elements of the Law and Practice of Legislative Assemblies*

in the United States (1856); and translations of several legal works from French and German.

CUSHING, Thomas, American political leader: b. Boston, Mass., March 24, 1725; d. there, Feb. 28, 1788. He was graduated from Harvard College in 1744, and from 1761 to 1774 was a member of the Massachusetts General Court, serving as speaker from 1766 to 1774. In 1773 he became a member of the Boston Committee of Correspondence, and in the following year a member of the committee of safety. He was elected to the 1st and 2d Continental congresses, but was replaced in 1776 because of his opposition to a declaration of independence. Once the die had been cast, however, he favored the American cause, and in 1776, 1777, and 1778 he was elected to the Massachusetts Council. In 1778 he was president of the New Haven Price Convention, and he was a delegate to the Hartford Convention in 1780. From that year until his death he served as lieutenant governor of Massachusetts.

CUSHING, William, American jurist: b. Scituate, Mass., March 1, 1732; d. there, Sept. 13, 1810. After his graduation from Harvard College in 1751 he taught school for a year and then studied law, being admitted to the bar in 1755. From 1760 to 1772 he was a probate judge and register of deeds in Maine, from 1772 to 1774 judge of the Massachusetts Superior Court, and from 1775 to 1777 acting chief justice of the new supreme judicial court, becoming chief justice in 1777. In 1779 he was a member of the state constitutional convention. He continued to serve on the state bench until 1789, when President George Washington appointed him associate justice of the United States Supreme Court (the first to be appointed). In 1794 he was defeated for the governorship of Massachusetts by Samuel Adams. During John Jay's absence in England in 1794-1795, he served as acting chief justice, and when Jay resigned in 1796, Washington offered Cushing the chief justiceship, which he declined on the grounds of ill health. During his tenure on the Supreme Court he delivered only 19 opinions, in all of which he concurred with the majority.

CUSHING, William Barker, United States naval officer: b. Delafield, Wis., Nov. 4, 1842; d. Washington, D.C., Dec. 17, 1874. He attended the United States Naval Academy from 1857 to 1861, but resigned before graduation. After the outbreak of the Civil War he rejoined the navy as an acting midshipman, and in 1862 became a lieutenant. He soon became known for his daring. In 1864, while in command of the *Monticello* on blockade duty off the North Carolina coast, he captured important Confederate officers at Smithville and a courier near Wilmington. His greatest exploit was performed on Oct. 27, 1864, when he torpedoed the Confederate ram *Albemarle* in the Roanoke River at Plymouth (see PLYMOUTH, N. C., ENGAGEMENTS AT), for which he was promoted to the rank of lieutenant commander. He also acquitted himself gallantly at Fort Fisher in 1865. After the war he served in the Pacific and Asiatic squadrons and as ordnance officer at the Boston Navy Yard. In 1872 he became a commander. In the following year, while in command of the U.S.S. *Wyoming*, he proceeded to Santiago de Cuba, where he

halted further executions of the *Virginus'* crew. Ordered to the Washington Navy Yard, he died before he could assume his new duties.

CUSHING, city, Oklahoma, situated in Payne County, at an altitude of 930 feet, on the Atchison, Topeka and Santa Fe and the Missouri-Kansas-Texas railroads, 40 miles west of Sapulpa. The center of an agricultural and oil-producing area, it has refineries, cotton gins, creameries, and iron works. Incorporated as a town in 1894 and as a city in 1913, Cushing is governed by a city manager and council. It owns and operates its electric, water, and sewage plants. Pop. (1950) 8,414.

CUSHMAN, köösh'män, Allerton Seward, American chemist: b. Rome, Italy, June 2, 1867; d. New York, N. Y., May 1, 1930. He was graduated from the Worcester Polytechnic Institute with the degree of B.S. in 1888, studied at Freiberg and Heidelberg, and then at Harvard, from which he received his M.A. (1896) and Ph.D. (1897) degrees. In 1900-1901 he was associate professor of chemistry at Bryn Mawr College, and from 1902 to 1910 assistant director of the Office of Public Roads and chemist in charge of investigations for the Department of Agriculture. In 1910 he founded the Institute of Industrial Research, Washington, D.C., of which he was director until his death. Cushman worked principally on the use of ground rock for fertilizer, the preparation of potash from feldspathic rocks, and iron and steel corrosion problems. His published works include *The Corrosion and Preservation of Iron and Steel* (1910) and *Chemistry and Civilization* (1920).

CUSHMAN, Charlotte Saunders, American actress: b. Boston, Mass., July 23, 1816; d. there, Feb. 17, 1876. A direct descendant of Robert Cushman (q.v.), she began her career as an opera singer, making her debut at Boston in 1835 in *The Marriage of Figaro*. Later that year, in New Orleans, she turned to the dramatic stage, appearing as Lady Macbeth. Her first New York success was achieved in 1837 in the role of Nancy Sykes in *Oliver Twist*. From 1842 to 1844 she served as stage manager of the Walnut Street Theatre, Philadelphia, and in the latter year accompanied William Charles Macready (q.v.) on a tour of the Northern states. She was acclaimed in England, where she acted from 1845 to 1849, and then toured the United States for three years. Although she announced her retirement in 1852 and lived for a time in England and Italy, she made frequent return engagements. At her last appearance on the New York stage, in 1874, she received a laurel wreath from William Cullen Bryant. She made her final appearance on any stage at Easton, Pa., in 1875. Miss Cushman's acting style was in the grandiloquent mid-19th century manner. Her best roles were Rosalind, Meg Merrilies in *Guy Rannering*, Queen Katharine in *Henry VIII*, and Romeo to the Juliet of her sister, Susan Webb Cushing (1822-1859).

CUSHMAN, Robert, English agent of the Plymouth colony: b. Canterbury, England, c.1579; d. England, 1625. About 1609 he settled in Leiden, where he joined the Pilgrim church and worked as a wool comber. With John Carver (q.v.) he went to London in 1617 to secure a patent for a settlement in America, which was

granted two years later. In 1620, Cushman and Carver made financial arrangements for vessels to transport the Pilgrim colony at Leiden to America. He himself did not emigrate on the *Mayflower*, but remained in England as the colonists' financial agent. In 1621, accompanied by his son, Thomas (who settled in America), he made a brief visit to Plymouth, where he preached a sermon entitled "The Sin and the Danger of Self-Love," the first sermon delivered in America to be printed (London 1622). He was also the author of a pamphlet, *Of the State of the Colony and the Need of the Public Spirit in the Colonists* (1621); and a tract, *Reasons and Considerations Touching the Lawfulness of Removing out of England into the Parts of America* (1622). In 1623, with Edward Winslow, he obtained for the Pilgrims a grant of territory on Cape Ann, but he never returned to America.

CUSHNY, kŭsh'nĭ, **Arthur Robertson**, Scottish physician and pharmacologist: b. Speymouth Moray, Scotland, March 6, 1866; d. near Edinburgh, Feb. 25, 1926. He was educated at the University of Aberdeen (M.A., 1886; M.B., C.M., 1889; M.D., 1892), and at Strasbourg and Bern. From 1893 to 1905 he was professor of pharmacology at the University of Michigan, and from 1905 to 1918 at University College, London. Appointed professor of materia medica and pharmacology at the University of Edinburgh in 1918, he occupied this chair until his death. Among his notable contributions to pharmacology were studies on optical isomers, kidney secretion, and the effects of digitalis on the heart. His published works include *A Textbook of Pharmacology and Therapeutics* (1899); *The Secretion of the Urine* (1917); *The Action and Uses in Medicine of Digitalis and Its Allies* (1925); and *Biological Relations of Optically Isomeric Substances* (1926).

CUSINS, kŭ'zĭnz, **Sir William George**, English composer and conductor: b. London, England, Oct. 14, 1833; d. Remouchamps, Belgium, Aug. 31, 1893. A member of the Chapel Royal at the age of 10, he was sent to Brussels to study at the Royal Conservatory of Music in 1844. In 1847 and again in 1849, he won a king's scholarship at the Royal Academy of Music in London. In the latter year he was appointed organist, and in 1870 master of music, to Queen Victoria. He became assistant professor at the Royal Academy in 1851, and later professor, and in 1867 succeeded Sir William Sterndale Bennett as conductor of the Philharmonic Society in London. In that post, which he held until 1883, he did much to further musical development in England; in 1892 he was knighted for his services. His works include the *Royal Wedding Serenata* (1863), an oratorio, *Gideon* (1871), piano and violin concertos, two concerto overtures, and songs.

CUSK, kŭsk, a northern fish (*Brosme brosme*) belonging to the cod family or Gadidae, characterized by an elongated body, a single dorsal fin extending the whole length of the back, fleshy ventral fins, and one barbel at the chin.

CUSP, kŭsp, in architecture, is the name given to a projection in the form of a triangle from the intrados or interior curve of an arch, or from the interior curve of tracery. Cusps are



Cusps, Early English style.

a feature of Islamic architecture, as in the Alhambra of Granada; and of Gothic buildings, particularly those of England. The simple cusps found in Early English structures give way to increasingly elaborate forms in the Decorated period.

CUSPARIA BARK. See **ANGOSTURA BARK**.

CUSO. See **BRAYERA**.

CUST, kŭst, **Henry John Cockayne**, English journalist and politician: b. London, England, Oct. 10, 1861; d. there, March 2, 1917. He was educated at Eton and at Trinity College, Cambridge. Later he studied law, but turned instead to politics, and from 1890 to 1895 and again from 1900 to 1906 was a member of Parliament. A famous wit, he edited the *Pall Mall Gazette* from 1892 to 1896. In 1914 he was a founder of the Central Committee for National Patriotic Organizations, whose chairman he became. In this capacity he did notable propaganda work. His *Occasional Poems* were published in 1918.

CUSTARD-APPLE, the common name of *Annona reticulata*, a small tree, 15 to 25 feet high, native to tropical America. Now widely spread throughout the tropics of both hemispheres, it is of economic importance because of its large, sweet fruits, 3 to 5 inches in diameter. Botanically, the fruits are syncarpia, formed by the growing together of the carpels and receptacle into a fleshy mass somewhat on the plan of a blackberry fruit, except that the carpels are more closely united. The fruits are of the size and shape of a small pineapple.

Several other species of *Annona* are valued for their delicious fruits, among them cherimoya (*A. cherimola*) and sweetsop or sugar-apple (*A. squamosa*). The pond-apple (*A. glabra*) is a tree 40 to 50 feet high, native to Florida, the Bahamas, and the Antilles. Its fruit has no comestible value. Fruits of cherimoya are sometimes seen in northern markets, but the annonas in general do not endure transportation easily. Another genus in the custard-apple family, *Annonaceae* (q.v.), is the papaw (*Asimina*).

ARTHUR H. GRAVES,
Connecticut Agricultural Experiment Station.

CUSTER, kŭs'tēr, **George Armstrong**, United States army officer: b. New Rumley, Ohio, Dec. 5, 1839; d. near Little Bighorn River, Montana, June 25, 1876. Following his graduation from the United States Military Academy in 1861, he was commissioned a 2d lieutenant and

assigned to the 2d Cavalry. He saw his first action at Bull Run on July 21. Transferred to the 5th Cavalry in 1862, he came to the notice of Gen. George B. McClellan, who made him his aide. In 1863 he was transferred to the staff of Brig. Gen. Alfred Pleasonton. Soon thereafter, for gallantry at Aldie (June 16), he was appointed brigadier general of volunteers. Given command of a Michigan cavalry brigade, he made it famous and helped check Gen. J. E. B. Stuart at Gettysburg. In 1864 his brigade was assigned to Gen. Philip H. Sheridan's corps, and Custer became known as one of the most brilliant officers in the Virginia campaigns, earning steady promotions. For his achievements at Yellow Tavern (May 11) he was brevetted lieutenant colonel; and for Winchester (September 19), colonel. On October 9, in command of the 3d Division of the Cavalry Corps, he won the splendid victory of Woodstock; on October 19, at Cedar Creek, he contributed to the Confederate defeat made famous by "Sheridan's ride," and was brevetted major general of volunteers. On March 2, 1865, his division won the Battle of Waynesboro, capturing 1,450 prisoners and 11 guns, and followed it up by annihilating Gen. Jubal A. Early's command and capturing all the rest of his artillery. Custer fought at Dinwiddie Courthouse (March 31) and Five Forks (April 1). He played a major role in the final defeat of the Army of Northern Virginia, and on April 9 received Gen. Robert E. Lee's flag of truce. He was then brevetted brigadier general and major general of the Regular Army (retroactive to March 13), and was made a major general of volunteers.

Assigned to duty in the Southwest, Custer was mustered out of the volunteer service in 1866 and resumed the rank of captain in the Regular Army. He then applied for a leave of absence to go to Mexico to assist Benito Juárez against Maximilian, but permission was refused by President Andrew Johnson, and in July 1866 he was assigned to the 7th Cavalry as a lieutenant colonel. He joined his regiment at Fort Riley, Kans., in 1867. Made a scapegoat for the failure of the campaign against the Cheyennes, he was court-martialed and suspended from the army for a year. In 1868 he was returned to duty by General Sheridan, and on November 27 of that year he won a major victory against the Cheyennes (see WASHITA, BATTLE OF). His regiment continued to serve in the West for two more years, but was then broken up, and Custer himself was stationed in Kentucky from 1871 to 1873. Reunited in 1873, the 7th Cavalry was assigned to Fort Rice, Dakota Territory, with Custer once more in command. In the following summer he headed an expedition to the Black Hills, where miners accompanying the party discovered gold. The ensuing rush to the area aroused the Sioux and Cheyennes in 1876, and a campaign was undertaken to subdue them.

Three columns were sent out, headed by George Crook, John Gibbon, and Alfred H. Terry, Custer's regiment being assigned to Terry's command. Meanwhile, Sitting Bull, the Sioux leader, had gathered a force of about 4,000 Indians on the Little Bighorn River in southern Montana. On June 22, Terry, who had been joined by Gibbon's column, sent Custer and his regiment directly to the Little Bighorn, while the rest of the force went up the Yellowstone River. Custer, with his 12 companies totaling about 655

up before attacking. In ignorance of the surprising strength of Sitting Bull's force, he reached the vicinity of the Indian encampment on the morning of June 25. Since the Indians discovered his presence, he decided to attack at once and prepared his plan of battle. He sent Maj. Marcus A. Reno with 3 companies across the river to attack the southern end of the Indian camp, and Capt. Frederick W. Benteen, also with 3 companies, to Reno's left. A single company was assigned to bring up the pack train, while Custer, with the remaining 5 companies, led an attack on the upper part of the camp. If the forces had been more nearly equal, the plan might have succeeded, and indeed the Indians had begun to retreat when they discovered the weakness of the attacking force. The three battalions forded the river, and Custer rode for the center of the Indian line. A rise of land hid the Indians, and as Custer swept down upon them they surrounded him. Vastly outnumbered, the 5 companies fought their way back up the ridge. Meanwhile, Reno had been repulsed and ordered a retreat, and Benteen did not reach the scene of the battle. Custer and his immediate command of 264 were all killed. Eventually the rest of the force assembled on a high bluff, where they were relieved by Terry on June 27. The site of the battle is now a national monument.

Custer has been blamed by some military historians for foolhardiness in attacking so large a force, and for having launched the attack before the agreed time. Yet the size of the force was not known when he set out, and the disaster might not have occurred if Reno had not retreated and if Benteen had come to Custer's assistance. Custer was the author of *My Life on the Plains* (1874).

His wife, ELIZABETH BACON CUSTER (1843-1933), whom he married in 1864, accompanied him on many of his Western campaigns. She published *Boots and Saddles, or Life in Dakota with General Custer* (1885); *Tenting on the Plains* (1887); and *Following the Guidon* (1891).

Consult Van de Water, F. F., *Glory-Hunter: A Life of General Custer* (Indianapolis 1934); *The Custer Story. The Life and Intimate Letters of George A. Custer and His Wife Elizabeth*, ed. by Marguerite Merington (New York 1950).

CUSTER BATTLEFIELD NATIONAL MONUMENT, Montana, situated in Big Horn County, on the Little Bighorn River, about 65 miles east of Billings by road. It covers an area of 765.34 acres. The site of the battle of June 25, 1876, in which George A. Custer (q.v.) and his immediate command were killed by Sioux Indians led by Sitting Bull, it was made a national cemetery in 1886 and a national monument in 1946.

CUSTINE, kûs-tên', COMTE Adam Philippe de, French army officer: b. Metz, France, Feb. 4, 1740; d. Paris, Aug. 28, 1793. He fought in the Seven Years' War, and by 1762 had risen to the rank of colonel. From 1780 to 1783 he served as quartermaster general of the French troops in America, and was present at the Battle of Yorktown. On his return to France, he was appointed governor of Toulon. In 1789 he was a member of the States-General and became imbued with the ideas of the French Revolution. Three years later he was placed in command of a Revolutionary army, with which he captured Speyer (Sept. 29, 1792), Worms (October 5),

and Mainz (October 21). Mainz was recaptured by the allies on July 23, 1793, after a three months' siege, however, and Custine was unable to relieve the city. Charged with conspiring with the enemies of France to effect a counterrevolution, he was convicted after a 13-day trial and guillotined.

CUSTIS, kūs'tis, **George Washington Parke**, American playwright: b. Mount Airy, Md., April 30, 1781; d. Arlington House, Fairfax County, Va., Oct. 10, 1857. He was a grandson of Martha Washington, his father, John Parke Custis, being her son by her first husband. With his sister, Eleanor, he was adopted by George Washington. Educated at the College of New Jersey (now Princeton University), he lived on his large estate, which is now Arlington National Cemetery (q.v.). His daughter, Mary Randolph Custis, married Robert E. Lee. Besides *Recollections and Private Memoirs of Washington* (1860), source of much of the Washington legend, Custis wrote several plays, including *The Indian Prophecy* (1827); *Pocahontas, or the Settlers of Virginia* (1830); and *The Railroad* (1830).

CUSTOM, a well-established and generally accepted practice which has the effect of law. In a broad sense, the term "custom" is practically synonymous with "usage," and the two words are frequently used interchangeably. In a more technical sense, a usage is merely a uniform course of conduct, not necessarily widespread, while a custom is a generally adopted and legally recognized practice. The former may be practiced by only one person or a group of persons in a particular locality, but the latter must have sufficient universality to cause the courts to accept it as a rule of law.

The essentials of a valid custom are long duration, notoriety, certainty, and uniformity. Some English cases hold that a custom must have existed from the time of legal memory (roughly, the 12th century), but this requirement obviously could not be met in the United States. The modern rule is that a custom must have been in effect long enough so that knowledge of it could reasonably be presumed. In addition to this requirement, a custom must be sufficiently general and universal to warrant the presumption that the persons involved made a contract or did some other act with knowledge of it. Persons engaged in a particular trade or business are charged with knowledge of, and legally bound by, the established usages of the trade. An indefinite or loose usage is not, however, binding on a person unless he has actual knowledge of it and assents to its application.

For it to become a rule of law, a usage must also have been generally and peaceably acquiesced in by those whose rights are affected by it. While this does not mean that a custom must be universally agreed to, it is clear that widespread contention and dispute will prevent a practice from having the force of law. A legally recognized custom must be reasonable, as well as being long continued, well known, uniform, and widely acquiesced in. The fact of generality is itself considered good evidence of reasonableness, and the burden of demonstrating the unreasonableness of an established usage is on the person attacking it. A custom or usage must, as a general rule, be consistent with established principles of law. Al-

though commercial law (q.v.) is based largely on the customs of merchants and bankers, the courts have frequently declared ineffective local customs which conflict with settled rules of common law, statutes, or constitutional provisions. Similarly, customs must be consistent with public policy, good morals, and fair practice in order to be legally recognized.

The effect of usages and customs is limited largely to the field of contract law. If a valid custom can be shown to exist, it has the same legal effect as an express term of a written contract. Evidence of usage and custom is admissible to aid in the interpretation of a written instrument and to ascertain the intention of the parties where the contract is silent, but not to vary or contradict an unambiguous agreement between the parties or to add new conditions to a contract which is complete on its face. The same rules concerning the admissibility of evidence of custom apply to oral contracts.

As a general rule, in the absence of an express or necessarily implied provision to the contrary, commercial contracts are deemed to be made with the understanding that prevailing trade usages and customs are incorporated by implication and become a part of the transaction. Technical words or terms in a contract are to be interpreted as they are generally understood by persons in the profession or business to which they relate. Similarly, abbreviations, signs, symbols, or figures in a contract may be explained by evidence of their special trade significance. Recourse may also be had to custom or usage to explain terms of measurement, quantity, weight, quality, time, and season.

RICHARD L. HIRSBERG.

CUSTOMHOUSE, an establishment where imports, exports, and articles in transit receive governmental clearance; where customs duties are collected and export drawbacks are paid; and where vessels in foreign trade and coastwise trade with noncontiguous territory are entered and cleared. In the United States customs activities are centralized at customs ports of entry, at each of which the principal office is the customhouse. The number of customhouses changes from time to time with changes in commerce, but is usually about 295, the maximum number of ports of entry being fixed by law at 324. The ports of entry in the United States (including Alaska, Hawaii, Puerto Rico, and the Virgin Islands) are distributed among 46 customs collection districts (see DISTRICT), each under the supervision of a collector of customs appointed by the president with the advice and consent of the Senate. The collector's office is in the customhouse of the headquarters port of his district, and each customhouse at a port of entry other than a headquarters port is in charge of a deputy collector responsible to the collector for the district. The collection of customs duties is administered by the secretary of the treasury through the Bureau of Customs, which is headed by the commissioner of customs. See also CUSTOMS, BUREAU OF.

CUSTOMS, Bureau of, a bureau of the United States government in the Department of the Treasury. When the United States Customs Service was established in 1789, the various collectors of customs were autonomous in their own collection districts. This naturally gave rise to discrepancies in the treatment of importers, ex-

porters, and shippers in the various ports of the country, and over the years a number of steps were taken to ensure more nearly uniform treatment at all ports. When the Office of the Secretary of the Treasury was reorganized in 1875, specific provision was made for a Division of Customs to exercise general supervision over the Customs Service. The division was the forerunner of the Bureau of Customs, which was created by an act of Congress approved on March 3, 1927.

The bureau, under the commissioner of customs, administers powers and duties vested in the secretary of the treasury pertaining to the importation and entry of merchandise into, and the exportation of merchandise from, the United States, and to the regulation of certain marine activities. Its principal function is the assessment and collection of import duties and, incident to this, the prevention of smuggling, including the smuggling of contraband, such as narcotics.

The bureau cooperates with other government agencies in enforcing preventive, sanitary, licensing, and other laws relating to articles brought into the United States and, in some cases, to outgoing articles. It maintains a service which investigates smuggling activities, compliance with the customs and navigation laws, and such administrative matters as may require investigation. It also handles the registry, enrollment, licensing, and admeasurement of vessels; the collection of tonnage taxes; the entrance and clearance of vessels and aircraft; the regulation of vessels in the coasting and fishing trades; the use of foreign vessels in the territorial waters of the United States; the recording of mortgages and sales of vessels; and related matters. In addition, the bureau examines, on behalf of the Department of State, the passports of American citizens departing from the United States at seaports and airports for certain countries.

RALPH KELLY,
Commissioner of Customs.

CUSTOMS COURT. See UNITED STATES CUSTOMS COURT.

CUSTOMS DISTRICTS. See DISTRICT—*Customs Districts.*

CUSTOMS DUTIES are usually understood to mean taxes levied at the frontier on imported goods, but in some countries they also include taxes on exports. They are among the most ancient forms of taxation and are used in practically all countries. In earlier times their ease and simplicity of collection recommended them as one of the major sources of revenue for central governments. Since World War I, however, their relative importance as a source of revenue has greatly diminished. Thus in the United States customs duties yielded 49.4 per cent of net federal revenue in the period 1906–1910, but only 0.9 per cent in 1953. The increase in federal government functions and revenue requirements has necessitated greater use of income and profits taxes and other internal revenue sources.

Purposes.—The chief purposes of customs duties are the raising of revenue and the protection of domestic industries or a combination of both. Where customs duties are imposed on goods which do not compete with domestic products, or where they merely compensate for equivalent taxes on home production, their main purpose

is usually fiscal. Where they are designed to handicap or exclude competitive imports, it may be assumed that their main purpose is protective. Taxes on imported goods are sometimes imposed under other names, such as import excise taxes, processing taxes, or fees. Such taxes may differ little, if at all, in their nature and purpose from customs duties. For protective purposes they are often supplemented by a variety of other devices.

Types.—Customs duties may be ad valorem (calculated as a percentage of value), specific (a certain sum per unit), or compound (a combination of the two). Methods of valuation of imported goods have an important effect on the incidence of ad valorem duties, and vary widely from country to country. In the United States valuation may be on the basis of export values, values for home consumption, United States value, estimated cost of production, or, in some instances, the value of similar goods produced in the home country, according to detailed rules prescribed by law. Classification and valuation are both subject to appeal to the courts. Some countries base their valuation on export values, others on laid-down costs, including freight.

Some customs tariffs are simple, while others are elaborately detailed and complicated. In 1953 the report of the Public Advisory Board for Mutual Security (Bell report) estimated that in the United States tariff there are as many as 8,000 separate and different rates of duty. Yet even this very highly detailed tariff, with its many differentiated rates, provides for only a small fraction of imported articles by precise specification. By far the greater number are covered by catchall paragraphs or basket clauses. Rates on many items are determined by the so-called rule of similitude.

Tariffs of most of the imported trading nations are periodically translated and reprinted by the International Customs Tariffs Bureau at Brussels. Their interpretation is, however, usually a matter for experts.

International Agreement.—The General Agreement on Tariffs and Trade (GATT), negotiated at Geneva in 1947, numbers some 34 signatory nations, which are collectively responsible for most of the world's trade. The contracting parties to this agreement have undertaken to exchange most-favored-nation treatment; to refrain from introducing new or wider preferences; and to refrain from new quantitative restrictions, especially those of a discriminatory character, except in narrowly restricted cases. They have also accepted certain obligations with regard to customs administration, and most of them have agreed to reduce or to bind their rates of customs duties on more or less extensive schedules of tariff items.

Incidence.—According to *International Trade, 1952*, a report published under the sponsorship of the contracting parties to GATT (Geneva, Switzerland, 1953, p. 62), the average percentage incidence of customs duties on a representative group of articles entering into international trade in 10 countries during 1952 was found to be as follows: Austria, 17; Benelux (Belgium, Netherlands, Luxembourg), 9; Canada, 11; Denmark, 5; France, 19; West Germany, 16; Italy, 24 (based on legal tariff, which is higher than tariff in force); Sweden, 6; United Kingdom, 17 (heavily weighted by fiscal duties on tobacco and spirits); and United States, 16. For reasons given in the report, however, all such comparisons, whether made by this or other methods, are regarded as

unsatisfactory and subject to wide margins of error.

See also **TARIFF**.

H. R. KEMP,
*Trade Policy Adviser, Canadian Department of
Trade and Commerce.*

CUSTOMS UNION, an association between sovereign states to form one customs area by eliminating interterritorial barriers and establishing a common tariff policy. The classic example of such a union was the German *Zollverein* (q.v.), initiated by Prussia in the 19th century to promote commercial unity among the independent German states and to adopt a uniform tariff against the world. When undertaken between large and small states, the union often emphasizes the domination of the larger power, as in the case of the treaty in 1862 between Italy and San Marino or Austria and Liechtenstein in 1875.

Although primarily an economic alliance, the customs union has more than once preceded important political unions, as in the case of the *Zollverein* and the customs union formed between the states of southern Africa prior to the formation of the Union of South Africa in 1910. Other notable examples of the customs union are the Pan-American union of 1890, the Austrian *Anschluss* and the Danube Federation before World War I, and the customs union between Belgium, the Netherlands, and Luxembourg in 1948 initiating the Benelux Economic Union.

CUSTOZA or **CUSTOZZA**, *kōōs-tō'tsā*, village, Italy, in the province of Verona, 11 miles southwest of the city of Verona. It is noted as the place where the Italians were twice defeated by the Austrians—under Count Radetzky on July 24, 1848 and by the forces of Archduke Albert on June 24, 1866. In 1879 a monument was erected to the fallen. Pop. (1936) 320.

Consult Nava, Luigi, "Campagna di Guerra del 1848," *Corpo di Stato Maggiore*, Fasc. 2, 1911; Pollio, Alberto, *... CUSTOZA (1866) ...* (Rome 1925).

CUT BANK, city, Montana, seat of Glacier county, 115 miles northeast of Great Falls on U.S. Highway No. 2 and the Great Northern Railroad. Altitude 3,890 feet. It is an agricultural community raising wheat, barley, flax, mustard seed, cattle, and sheep. Chief mineral resources are natural gas and crude oil, and oil refining constitutes the major industry. The city is the eastern boundary of the Blackfeet Indian Reservation.

Incorporated in 1911, Cut Bank became the seat of Glacier county on its formation in 1919. It has an alderman form of government. Pop. (1950) 4,715.

CUT GLASS. See **GLASS, VARIETIES OF**; **GLASS, ORNAMENTATION OF**.

CUTHAH, *kū'thā*, ancient city, Babylonia, mentioned in the Bible (2 Kings 17:24) as one of the cities from which the king of Assyria took people to colonize Samaria. Its site has been identified with the mound, Tell Ibrahim, by the archaeologists Sir Henry Rawlinson, Hormuzd Rassam, and Friedrich Delitzsch. This mound, which was partially explored by Hormuzd Rassam in 1880-1881, is 60 feet high and two miles in circumference and lies 20 miles north of Kish

and 35 miles southeast of the city of Sippar.

Cuthah was an important center for the worship of the solar deity, Nergal, who has been described in ancient writings as the god of war and pestilence and of the lower world. The name of his chief temple at Cuthah was E-shid-lam, and he appears, with few exceptions, to be connected exclusively with this locality.

The occupation of Samaria by settlers from Cuthah (Cuth, Cath) caused the Jews of a later epoch to call the Samaritans Cathites.

CUTHBERT, *Saint*, English anchorite, cenobite and bishop: b. about 635; d. Farne, Northumbria, March 20, 687. He is one of the three most eminent saints of the Church in England, the other two being Saint Edmund of Edmundsbury, and Saint Thomas à Becket, archbishop of Canterbury. The time and place and even the country of his birth are unknown, but the most trustworthy historians say he lived from 635 to 687.

In 651 he entered the monastery of Melrose (the first Melrose), at that time within the limits of Northumbria, and after making his religious profession there, was successively prior of that abbey, prior of Lindisfarne, bishop of Hexham and bishop of Lindisfarne, with intervals in which he withdrew from conversation with all men and lived a recluse hermit on the island of Farne. The fame of his sanctity, religious zeal and miracles was great in his lifetime; but grew steadily greater after his death, and many churches in England were dedicated to him. It is said that his body was found incorrupt when his tomb was opened 11 years after burial.

When Norse corsairs threatened Lindisfarne in 875, the monks of Lindisfarne bore Cuthbert's remains to a place of safety inland, and for a time the body had no fixed resting place until deposited at Durham, where, enclosed in a splendid shrine, it remained till the Reformation, an object of veneration and the supposed instrument of incessant miracles. At the Reformation the shrine, with its costly ornamentation, went to increase the king's treasure, and the body of Cuthbert was buried under the pavement of the Durham Cathedral. The coffin was lifted in 1827 and the body, or rather the skeleton, of the saint, was found wrapped in five robes of embroidered silk; there were three coffins, one within another, namely, an outermost one, made in 1541, within that another, believed to date from 1104, and then the *cista*, in which the relics were deposited when the body was disinterred in 698.

His feast is observed on March 20. His life has twice been written by the Venerable Bede and still earlier by a monk of Lindisfarne.

Consult Colgrave, Bertram, ed. and tr., *Two Lives of St. Cuthbert; a life by an anonymous monk of Lindisfarne and Bede's prose life* (New York 1940).

CUTHBERT, *kūth'bért*, city, Georgia, Randolph county seat, 60 miles south of Columbus on the Central of Georgia and Seaboard railroads at an altitude of 446 feet. The town is a trading center for a fruit, corn, cotton, and peanut region in which a great variety of timber grows. It has cotton and lumber mills, a cannery, and manufactures soft drinks and baskets. Beef cattle is also raised in the vicinity. Andrew College (Methodist), a junior college for

women is here. Cuthbert was incorporated as a village in 1834. Pop. (1940) 3,447; (1950) 4,033.

CUTICLE. See SKIN AND SKIN DISEASES.

CUTLASS, küt'lās (Fr. *coutelas*, small knife), a short sword used by seamen. The blade was usually about 27 inches long, an inch wide, and had a bowl-shaped guard on the hilt. It served as a very effectual weapon in close contest; because of its shortness could be handled easily, and yet was long enough for defense.

CUTLASS FISH. See SCABBARD FISH.

CUTLER, küt'lēr, **Manasseh**, American Congregational clergyman: b. Killingly, Conn., May 13, 1742; d. Hamilton, Mass., July 28, 1823. He was graduated at Yale in 1765, and served as minister from 1771 to 1823 at Ipswich, now Hamilton, Mass. After the Revolutionary War, he helped form the Ohio Company for colonizing the Ohio River Valley. He assisted in drafting the noted Ordinance of 1787. He was a member of the Massachusetts General Court from 1800 to 1805. He was also a botanist of distinction, describing 350 species of plants native to New England.

Consult Cutler, W. P. and J. P., *Life, Journals, and Correspondence of Rev. Manasseh Cutler* (Cincinnati, Ohio, 1888).

CUTLER, Timothy, American clergyman: b. Charlestown, Mass., May 31, 1684; d. Boston, August 17, 1765. He was graduated at Harvard in 1701; was a Congregational pastor at Stamford, Conn., 1710-1719, when he became rector of Yale College. Three years later he went to England and was ordained in the Church of England by the bishop of Norwich in 1723. Taking charge of Christ Church, Boston, Mass., 1723, he remained its rector until his death.

CUTLERY, küt'lēr-i. This term is applied to hand-operated cutting implements: pocket-knives, straight razors, scissors and shears, and fixed-blade knives. The last includes household, butcher, and table knives, combinations of fork and spoon with steel blade and handle made of materials other than metal, carvers, cleavers, spatulas, putty knives, and paint scrapers. Hunting knives, generally supplied with a leather sheath, also belong in this category.

Pocketknives are those whose one or more blades fold into a handle. They are divided into two general types known as penknives and jackknives. The straight razor is used almost exclusively by the professional barber. Scissors consist of two cutting blades which operate on a pivot hinge and have one bow for the user's thumb and the other for one finger, whereas shears have a thumb bow and another large enough for two or more fingers. Fixed-blade knives come in a wide variety of patterns and shapes designed for domestic, professional, and industrial use.

Although many of the processes in the manufacture of these four types of cutlery are the same, they create in reality quite different trades, since they require diverse skills even for what would seem to be identical operations. While a few manufacturers make several or all kinds of cutlery, most specialize in only one.

History.—Perhaps because of the easy avail-

ability of cutlery neither its importance to our domestic economy nor its vital role in the development of civilization is generally recognized. The time of prehistoric man, with his crude knives of stone or flint was so completely occupied by pursuit and preparation of enough food to sustain life that he had almost none left for the cultivation of any of the arts. But with his discovery of copper and tin, ushering in the Bronze Age, his cutting tools so improved that he found time for the beginnings of many of the arts and crafts, which have descended to us through the generations. The discovery of iron—the advent of the Iron Age, about 1000 B.C.—led to the improvement of cutting tools and weapons and so laid the foundations of modern civilization.

The early art of making cutlery was shrouded in secrecy and in mystery. The alloying of iron with the proper amount of carbon—the element supplying hardening qualities in iron and converting it into forgeable steel—was a very unpredictable matter because of the crude smelting facilities available. There are many romantic and mythological stories woven around the forges which produced the famous swords of King Arthur's and Siegfried's times. The beginnings of the cutlery industry, as we know it, are accredited to the latter part of the 13th century. The cutlers' guilds of that period established through their very exacting system of apprenticeship many of the basic principles which are used in the manufacture of modern cutlery. It was not until 1740 that a clockmaker, in search of a more uniform steel for his clock springs, melted bars of iron in a crucible, added a definite amount of carbon, inserted other ingredients, and so produced a steel on which one could depend for a more uniform knife blade with properly hardened qualities. As late as 1940 such steel, made by the crucible method, was utilized in making the finest cutlery. Both it and some open-hearth steel are still used, even though electric-furnace steel is proving itself to be the most uniform and durable yet available.

Metallurgical advances of American producers of steel since 1940 have evolved for knife blades steels superior to the finest ever before produced. One is the straight-carbon steel, which runs from 60-point to 120-point carbon; the higher the carbon content, the tougher and the harder to work. Another is the regular stainless steel, a low-carbon steel alloyed with chromium for toughness and resistance to stain. A third is high-carbon stainless steel, which is in some grades as high as 100-point carbon; it is stainless because of the chromium present. The fourth is chrome-vanadium steel, very tough and, when chrome-plated, stain resisting as long as the plating lasts.

In early times the cutler got his steel in square bars. The first step was to heat to a high temperature the section required for a blade. Then, with one operator holding the heated section on an anvil and changing its position as required, a hammer man would gradually hammer it down to a flat surface slightly thicker than the gauge of the finished blade. This forging process accomplished a double purpose: it not only compacted the molecules in the structure of the material by bringing it down to gauge, but it also helped to expel some of the impurities which still might be in the steel. Although the mechanically operated beam hammer was invented early in the 19th century, the English cutlery guilds would not permit its use in the trade.

This circumstance gave the cutlery industry in the United States its chance. It is recorded that a small cutlery plant was started in 1818 in New England and that a forge for the manufacture of table knives began operation in Massachusetts in 1834. The latter was equipped with the beam hammer, with which one operator—or hammer man—could produce from four to six times as many forged blades per hour as two men could make under the English system. Also, because of the hammer's rapid strokes, the forging could be done with one heating of the blade—a process not always possible under the manual method; the result was a better product.

Modern Processes.—In the case of pocket-knife blades, razor blanks, scissors, and shears, forging is done by placing the heated steel between two dies in a heavy drop hammer; this not only compacts the metal, but also "flows" it into a shape resembling the finished blade. Under either method these forged blanks are sheared and ground to shape or trimmed in dies. Forging with mechanical hammers and with heavy drop hammers is still employed for the fine forged knives preferred in some professions, even though the greatest volume of modern knives is made from sheet stock. The latter method, in modern rolling mills, provides the manufacturer with a steel structure differing so little from that obtained by forging that in wearing and edge-holding qualities the finished blades are indistinguishable. The trimmed blade is now hardened, by bringing it to a cherry red—between 1700° and 2000°F.—and by rapidly cooling it in water, oil, or a saline solution. Originally this was done in a forge with charcoal or coke, but the prevalent practice is to use a pot of molten lead, whose heat is accurately controlled by a precision instrument known as a pyrometer. Electrically heated and operated hardening furnaces by 1950 rapidly were replacing the lead pot with resultant accuracy and uniformity in hardening. When hardened, the blade is pale gray in color, very brittle, and must have its brittleness reduced or drawn by tempering. Formerly this was done on a heated metal plate or on hot sand, by gradually raising the temperature to about 600°F. As this heating process progresses, the color of the steel changes from strawcolored to brown, to purple, to dark blue, and lastly to light blue. Where greater hardness is desired, as in a straight razor, the drawing process is checked when the color reaches a pale straw; but a pocketknife's blade is drawn to a purple, while a knife blade requiring flexibility as well as hardness is usually drawn to a pale blue. The early cutler had to depend upon his visual color perception to obtain what he considered the correct temper. Under modern methods pyrometers accurately control all heats and tempering is largely done in mechanically operated ovens working with exactness on predetermined levels. Thus human guesswork is eliminated completely and greater uniformity is found in the finished product.

Following the heat treatment, the blade goes to the grinder; by grinding off the rough outer scale and some of the material he reduces the thickness of the blade more nearly to the finished gauge. This was once done on a coarse sandstone about six feet in diameter and seven or eight inches thick. The stone was kept wet with water and revolved away from the grinder, who sat on a wooden frame known as a horsing, placed

on top of the stone and slightly beyond its top center. Holding the blade in a wooden jig, called a flat stick, and using his arms, his shoulders, and frequently his entire weight, he "rode" the blade until it was reduced to the correct thickness. This was a hazardous operation, since occasionally a stone would break with disastrous or even maiming results; it was also an unhealthy one. Working all day in clothes which were damp and soggy from the spray thrown off the wet stone and inhaling the moist sandstone dust, only a rugged constitution failed to contract what was called grinder's consumption, a form of silicosis. This rough grinding is now done on machines which operate in pairs, one grinding the face of the blade and the other the back. One operator usually tends two pairs of machines, which automatically draw the blade across the wet stone for one or more passes, according to the amount of material to be removed. Following the rough grind, the blade is "whettened" to smooth the surface and to remove the rough grind marks. This was done formerly—and it still is done—on the finer knives and on those which are taper ground from handle to point, on a stone similar to the rough grindstone but of much finer texture. The operation is continued until a smooth "bottom" is achieved and the blade is ready for the final polish or "glaze."

Except as stated above, whetting now is done mechanically on machines known as double-headers. This machine consists of two wheels about two feet in diameter, held in a frame directly opposed to and turning toward each other, one wheel moving horizontally in the frame and being operated by a foot pedal. The operator, holding the back of the blade on a rest, pulls it back and forth between the wheels, at the same time bringing the wheels together under pressure by means of the foot pedal. These wheels are faced with walrus hide or felt, which is "doped" with wax and emery "cake," applied as needed by the operator; it whettens out the rough grind marks from both sides of the blade simultaneously. Knives supplied with a dull finish also have their final polish on a double-header, using flour emery in the "cake." The high polish or "mirror finish" originally was obtained on a slowly revolving wooden wheel about two feet in diameter, which sometimes was faced with leather but more often was left uncovered; then polishing by hand followed, with rouge or rotten stone as the polishing agent. Mirror finishing is now done on a machine which has two rapidly revolving cotton buffs operating like a washing machine's wringer. Several blades are anchored in a frame or holder, which pushes them in and out between the rollers with an oscillating motion, until all signs of any grind marks have been obliterated. Up to this point the manufacture of fixed and pocketknife blades is almost identical.

The fixed blade is now ready for its handle, whereas the pocketknife's blade must have its shoulder milled accurately and the end of the tang—which operates against the spring—finished. Fixed-blade knives are made with (1) a "full" tang, to which slabs or "scales" of wood or other material are riveted through its entire length; (2) a "half" tang, which is inserted in a slot cut part way down a solid handle and held in place with at least two rivets; (3) a flat or "push" tang, inserted in a hole drilled in the end of a solid handle and held by friction or with a

rivet driven through the handle and through a hole in the end of the tang; and (4) a round or "rat-tail" tang, which either is forced into a slightly smaller hole in a solid handle and held by friction or, as in the case of a staghorn handle, is cemented with a heat-resistant material.

Materials for handles commonly used are such imported woods as rosewood, cocobolo, boxwood, a few others less well known, and such domestic woods as beech, birch, maple, and walnut. Growing in popularity is a plastic-impregnated wood bearing several trade names, the best known of which is "Pakkawood." Other materials are plastics, hard rubber, genuine staghorn, water-buffalo and other horns, bone, aluminum, and mother-of-pearl; this last is used chiefly for fine penknives, fruit knives, and table knives. In early times, ebony, ivory, semiprecious stones, and baked clay were used as handles; some beautiful examples of workmanship may be seen in museums. Some manufacturers make their own handles from log or plank, while others procure these from specialists in producing handles. Considerable skill is required for manufacturing a fine handle which will not split or check or shrink after hafting.

When the handle has been attached, most types must be sanded, shaped, and polished—processes requiring considerable skill. The blade is now given its final edging. This is done usually on a fine, revolving oilstone and is followed by honing on a regular, flat oilstone. Proper grinding and edging are the two most important operations in the fabrication of a knife of fine steel which has been properly treated by heat and ground. But these processes sometimes are skimmed to reduce the cost.

The hafting of a pocketknife is a far more complicated operation. The handle—in all but an all-metal knife—consists of at least seven pieces: two linings, two outer scales, two bolsters, and one spring. All these parts must be assembled and riveted, with the main rivet as the hinge on which the blade revolves. After assembly the spring must be adjusted carefully to give just the proper tension for holding the blade firmly either open or shut; the spring must allow the blade to work smoothly, to open in a straight line, to close just enough to cover the point and yet to be high enough for the nail mark to be easily accessible. Assembly is even more complicated where there are two or more blades, with the extra spring or springs and dividers, and with the blades to be adjusted for folding so that they pass each other without interference. The assembly and adjustment of pocketknives is called cutlery, and a cutler is one of the most skilled workmen in the entire metal industry.

Since 1930 great progress has been made in the manufacture of pocketknives by machinery. Specially designed, ingenious machines have been built which have practically eliminated handwork and have made mass production possible. In 1950 there were available in the low-price field knives of good value for their cost.

The concave grinding of a razor is done on a stone not more than three inches in diameter. It is a highly skilled art. So also is the grinding of fine manicure scissors, with their curved blades and sharp points. It takes years of experience to develop the fineness of touch requisite for a grinder in these fields. Four types of material are used to make scissors and shears: cast hard iron, pressed cold-rolled steel, solid

steel, and steel laid. The blanks for cast iron are molded; those for cold-rolled steel are made between dies under sufficient pressure to "flow" the material; both solid and steel laid are made under a drop hammer. The difference between the last two types is found in the steel structure: the solid-steel blade is, as the term implies, all one piece of cutlery steel, whereas the steel-laid blade has a strip of high carbon steel for the cutting edge, which is laminated to a milder steel backing and frame. The steel-laid type is found chiefly in the heavy shears used by tailors and in the clothing industry. The grinding, assembly, and adjusting of the blades—so that the edge of the upper blade engages the edge of the lower blade smoothly and with equal pressure for their entire length—is of major importance; it requires highly developed skills for production.

The cutlery industry in the United States is small as compared with its importance in American domestic economy. Annual gross sales averaged about \$50,000,000 in 1950, when some 50 companies employed approximately 10,000 persons, of whom about 20 per cent were women. Small as it is in dollar volume, cutlery manufacture ranks among the greatest in importance. Food production—from the farmer, the cattle-raiser, and the fisherman to the butcher and the housewife—is completely dependent upon an adequate supply of knives of high quality. The mechanic, the carpenter, and many other artisans must rely upon knives in their vocations. The shoe, textile, rubber, shipbuilding, and numerous other basic industries require many types of knives in their production lines. The armed forces—especially the Air Force—must have several varieties of cutlery; indeed, in the United States production for civilian use was curtailed during World War II in order that military needs could be supplied.

The American cutler stands in the forefront of the industry. He has the finest materials available, the technical knowledge, the appreciation of styling, which—dollar for dollar—give American-made cutlery its prestige. With precision machines and processes accurately controlled, uniformity in the finished cutlery product never has been surpassed.

LEWIS D. BEMENT,
Secretary, Associated Cutlery Industries of America.

CUTTACK, kūt'āk, city, Republic of India, capital of the state of Orissa, on the Mahanadi River 220 miles southwest of Calcutta. There are a government college and school of engineering. A high standard of silver filagree work is manufactured. The city is the center of the extensive Orissa irrigation canal system. Cuttack is the seat of a district of the same name which under British administration had an area of 3,654 square miles; salt is manufactured on the coast, and rice cultivated inland. The city was the capital of Orissa under Hindu kings, the Great Mogul, and Maratha rulers down to 1803, when it was captured by the British in the Second Maratha War. Pop. (1941) 74,291.

CUTTAGE, kūt'ij, the propagation of plants by means of slips or cuttings which are detached parts of roots, stems, or leaves. This form of asexual or bud propagation is found in nature among willows, poplars, and many other trees and shrubs, especially such as are readily

broken by wind and drop their twigs and branches into streams and ponds with muddy shores. Artificially, it is one of the oldest methods known and is of wide importance, ranking with graftage (q.v.) and seedage. The advantages of cuttage are that, with the rare exceptions due to bud variation, plants may be propagated true to variety or species in very great number, and the cost of production of the kinds commonly so propagated is small when compared with certain other methods such as division and layerage, in which cases roots are developed before the removal of the parts which become new individuals. An idea of the scope of this practice may be obtained from the fact that, except in the production of new varieties which are obtained by means of seeds, the great majority of florists' perennial plants such as roses, carnations, violets, chrysanthemums, are so obtained, as are also many fruit plants such as gooseberries, currants, grapes, and pineapples, though in the last instance other methods are also used to a large extent.

The methods for making the cuttings "strike" root are very various. Some species such as currant and gooseberry will soon produce roots if plunged in moist soil out of doors; others must be grown under glass, often with extra degrees of heat in the soil (bottom heat), in propagating boxes (glass-covered frames upon the greenhouse benches), and other devices, as well as specially favorable soils, etc. The methods of making the cuttings also differ widely with the species of plant and the part used, as the following classification will show:

CUTTINGS.		
Roots or Rootstocks	Stem	Leaf
Short, under glass, Dracaena.	Growing wood, Soft-Fuchsia. Hard-Rubber plant.	Entire, laid flat on surface, Begonia.
Long, in open air, Blackberry.	Ripened wood, Long, in open air, Currant.	Divided, Begonia, Rex
By tuber cuttings, Potatoes.	Short, under glass, Yew.	Bulb Scales, Lily.

As a general rule, to secure the best success with cuttings, a well-drained, sandy soil is necessary, and, in most cases, it is desirable to have bottom heat. Consult Bailey, L. H. *The Standard Encyclopedia of Horticulture*, vol. 1, pp. 925-930.

CUTTEN, George Barton, Canadian educator: b. Amherst, Nova Scotia, April 11, 1874. He graduated B.A. at Acadia University, Wolfville, Nova Scotia, in 1896 and at Yale in 1897 (B.D. 1903). Ordained to the Baptist ministry in 1897, he held pastorates successively at Montrose, New Haven, Conn., Corning, N. Y., and Columbus, Ohio. In 1910 he was appointed president of Acadia University, Wolfville, Nova Scotia, and from 1922-1942 was president of Colgate University. His works include *The Psychology of Alcoholism* (1907); *Psychological Phenomena of Christianity* (1908); *Three Thousand Years of Mental Healing* (1911); *Mind—Its Origin and Goal* (1925).

CUTTER, Ephraim, American physician: b. Woburn, Mass., Sept. 1, 1832; d. West Falmouth, Mass., April 25, 1917. He was graduated

at Yale University in 1852; practiced medicine in his native city till 1875, in Cambridge and Boston till 1881, when he removed to New York and began practice there. He has invented a large number of surgical instruments; contributed over 400 articles to literature on scientific subjects, including microscopic medicine, laryngology, chronic diseases and general medicine; and became a member of the Massachusetts Medical Society in 1856, and of the American Medical Association in 1871. He was a pioneer of American laryngology; he studied the morphology of raw beef from 1854 and discovered the tuberculosis cattle test in 1894.

CUTTER, George Washington, American poet: b. Massachusetts 1801; d. Washington, D. C., Dec. 24, 1865. He practiced law in Kentucky until 1845; served as a captain in the Mexican War; became active in politics, and received a treasury clerkship. His poems are nearly all included in *Buena Vista, and Other Poems* (1848); *Song of Steam, and Other Poems* (1857); *Poems, National and Patriotic* (1857).

CUTTER, a name given to two kinds of small vessels. The first is one of the supplementary small-boats of a man-of-war equipped for both rowing and sailing. The cutters used by yachtsmen and by pilots, and revenue cutters are built with especial reference to speed, and have a single mast, and a "single-stick" straight-running bowsprit that may be housed in-board in dirty weather. They are much like the sloop in rig. The hull of the cutter is very deep and narrow, being almost V-shaped, with an almost perpendicular rise from the floor to the bulwarks, and a keel heavily loaded with lead. In heavy weather, working to windward, the cutter shows to best advantage. (See YACHTS and YACHTING). A light sleigh with a single seat is called a cutter in some parts of the country. A revenue cutter is a light armed government vessel commissioned for the prevention of smuggling and the enforcement of customs regulations.

CUTTING, Charles Suydam, American naturalist: b. New York City, Jan. 17, 1889. He received his preparatory education at Groton School, and then entered Harvard from which he received his A.B. degree in 1912. He has been actively engaged in naturalist work, and at various times has done field work on 10 expeditions to parts of Central and Southeast Asia for the American Museum of Natural History, New York; the Field Museum of Natural History, Chicago; and the Pitt River Museum of Oxford, England. During World War I he served as first lieutenant in the United States Army, and was with the American Expeditionary Force in France for 15 months. For his services he was decorated with the Croix Noire (French). He is a trustee of the American Museum of Natural History, and the New York Zoological Society; and an honorary fellow of the Field Museum of Natural History. He also holds membership in the Bombay Natural History Society, the Royal Geographic Society, the Central Asia Society, and the Himalayan Club. As a result of his travels in Asiatic and African countries he collected considerable zoological information which has been

published by the American Museum of Natural History.

CUTTING, Mary Stewart Doubleday, American author: b. New York, N. Y., June 27, 1851; d. Orange, N. J., Aug. 10, 1924. In the early 1890's she began publishing short stories, typical of which appeared as *Little Stories of Married Life* (1902; 2d ed., 1909); *Little Stories of Courtship* (1905); and *The Wayfarers* (1909).

CUTTING, Robert Fulton, American civic leader: b. New York, N. Y., June 24, 1852; d. Tuxedo Park, N. Y., Sept. 21, 1934. Following his graduation from Columbia University (A.B., 1871; A.M., 1875), he helped found (1897) and became first chairman of the Citizens Union; was president (1893-1913) of the New York Association for Improving the Condition of the Poor; was president (1899-1934) of the New York Trade School; and, for several years, served as president of Cooper Union and later board chairman. He also helped establish or headed the New York Bureau of Municipal Research and the City and Suburban Homes Company, which built low-rent homes and model tenements.

Cutting politically fought both Tammany Hall and Republican bosses, and was the principal sponsor of Seth Low in the latter's successful election in 1901 as mayor of New York. Cutting was a director of several corporations and banks and published *The Church and Society* (1912).

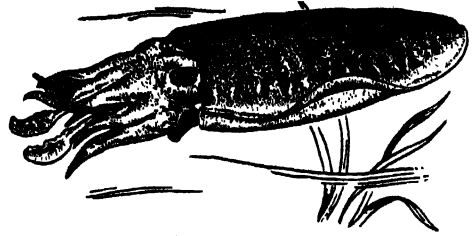
CUTTING, Starr Willard, American educator: b. West Brattleboro, Vt., Oct. 14, 1858; d. Brattleboro, Vt., Oct. 19, 1935. Graduated from Williams College in 1881, he studied at the universities of Leipzig, Geneva, and Johns Hopkins (Ph.D., 1892), and in 1892 went to the University of Chicago, where he rose to professor of Germanic languages and literature (1906-1923). His published works included *The Modern German Relatives Das and Was* (1904) and *Gutskow and Young Germany* (1913).

CUTTING, a detached part of a plant used for propagation. See CUTTAGE.

CUTTLE, Captain Edward, retired sea captain in Dickens' *Dombey and Son* (q.v.), who took care of Florence Dombey. His favorite expression, "When found, make a note of," became the motto, until 1923, of the periodical *Notes and Queries*.

CUTTLEBONE, calcareous dorsal plate of the cuttlefish (q.v.), used to supply cage birds with lime and salts. The cuttlebone has been used in making cosmetics, as a medical absorbent, in preparing parchment before inking, to prevent the spreading of ink on unsized paper or over an erasure, and, more recently, in preparing fine abrasives and dentifrices.

CUTTLEFISH, a name commonly applied to mollusks of the class Cephalopoda—often to the squid and octopus. More correctly the term refers to the family Sepiidae of some 100 species, the best known of which is the *Sepia officinalis*, a European variety. The cuttlefish is used as food in Japan, India, Italy, and Greece, and yields the cuttlebone (q.v.) and a fluid used to prepare a rich brown (sepia) pigment.



Cuttlefish, *Sepia officinalis*.

The cuttlefish *Sepia officinalis* measures from 6 to 10 inches in length, is oval in shape, and has a slightly flattened surface. Although other species may be differently hued, the European variety usually ranges in color from pale-gray to dark-brown or neutral tints.

The trunk of the cuttlefish, along each side of which is a horizontal fin, is contained in a tough muscular sac (mantle). The integument consists of a single layer of cells lying on connective tissue in which are embedded chromatophores, or pigment-containing cells. By expansion of the cells the pigment becomes diffused and by their contraction, concentrated, a process which results in rapid flashes of changing color. Between the muscular sac and the body proper lies the mantle-cavity containing organs of the respiratory, digestive, and reproductive systems. The cuttlebone, or leaf-like internal shell, lies in the dorsal portion. Lying parallel to the terminal portion of the intestine is the "ink-bag," a gland from which originates a deep-brown fluid that can be ejected at will through the funnel, which opens on the exterior behind the neck.

The cuttlefish has a broad, distinct head, the front of which bears two large, highly developed eyes, and two long tentacles and eight shorter arms. The arms and tentacles, whose bases surround the mouth opening, are sucker-bearing and are used to capture and assist in holding prey—sometimes fish, but usually crustacea.

Cuttlefish are usually found in shoreline regions or in moderately shallow water. Ordinarily they rest horizontally on or near the sea floor, with their fins gently undulating, their tentacles withdrawn into pockets situated beneath the eyes, and their arms depressed. Although the fin is the basic swimming organ, the cuttlefish can force a stream of water through its funnel to assist in propulsion. See also CEPHALOPODA; MOLLUSCA.

C. W. COATES.

CUTTS, John, BARON CUTTS OF GOWRAN, English soldier: b. Arkesden, Essex, 1661; d. Dublin, Ireland, Jan. 26, 1707. He was educated at Cambridge University, from which he received an honorary LL.D. degree in 1690. In 1686 he fought with the English volunteers against the Turks in Hungary. He went to the Netherlands in 1688 and then returned to England as lieutenant colonel, and later colonel, of a regiment in the service of William of Orange. He distinguished himself at the Battle of the Boyne and was wounded at the siege of Limerick. For his services he was created Baron Cutts of Gowran in Ireland in 1690. Promoted to the rank of brigadier general, he fought at Steinkirk in 1692. In the following year he was appointed governor of the Isle of Wight.

He fought heroically at the siege of Namur in 1695, and two years later he helped to negotiate the Treaty of Ryswick. In 1701 he accompanied the earl (later duke) of Marlborough to the Netherlands. In the following year he was promoted to the rank of major general, and in 1703 to that of lieutenant general. He served as third in command at the Battle of Blenheim (1704), and in 1705 was appointed commander in chief of Ireland, serving until his death.

CUTTY STOOL, the name given to the seat formerly set apart in Scottish churches and on which offenders, especially against chastity, were exhibited to the congregation and made to listen to the minister's rebukes before being readmitted to church privileges.

CUTTYHUNK ISLAND, island, Massachusetts, situated in Buzzards Bay. The westernmost of the Elizabeth Islands, it is a summer resort and the seat of Cuttyhunk, the only village in the chain, and of a United States Coast Guard station. It was on Cuttyhunk that Bartholomew Gosnold (q.v.) landed on May 25, 1602, and established the first white settlement in New England. He built a fort and named the island Elizabeth's Isle after the queen of England. The settlement lasted less than a month before it was abandoned.

CUTWORM, the larva or caterpillar of the owlet moth (Noctuidae) family, widely distributed in North and South America, which contains some 20,000 species. The most common varieties include the army worm, the army cutworm, and the variegated cutworm (see ARMY WORM).

Cutworms vary in length from one to two inches, are cylindrically shaped and usually smooth-surfaced, and are often dark ashy gray in hue, with brownish coloring at the head. They are hatched from eggs laid in the late summer or early fall, but sometimes earlier. The eggs may remain over the winter or they may hatch within a few days. By late autumn those which have been hatched are nearly full-grown and bury themselves in the ground for the winter.

Destructive to small grains, grasses, tobacco plants, vegetables, and ornamental plants, cutworms lop off small plants at or near ground level, climb the plants, and feed on the foliage or bore into the developing flower buds. They usually remain hidden under clods of earth or in topsoil by day and emerge to feed at night.

A standard method of ridding garden cutworms is to spread poison bait, containing a mixture of sodium fluosilicate or paris green mixed with wheat bran, over an infested area when the caterpillars are most active. Sprays of dust containing DDT and Toxaphene are effective control agents. See also MOTH.

CUVIER, kü-vyā', **BARON Georges (Léopold Chrétien Frédéric Dagobert)**, French naturalist: b. Montbéliard, Doubs, Aug. 23, 1769; d. Paris, May 13, 1832. Member of an old Protestant family, he was educated at Stuttgart and in 1788 became tutor to the family of the comte d'Héricy near Caen. While in Normandy, he made the acquaintance of the agronomist A. H. Tessier, who gave him letters of introduction to Antoine Laurent de Jussieu and Étienne Geoffroy Saint-Hilaire in Paris.

In 1795, Cuvier was appointed assistant at the Jardin des Plantes and became a member of the Académie des Sciences. In the following year he became a lecturer at the École Centrale du Panthéon, and in 1799 he succeeded L. J. M. Daubenton as professor of natural history at the Collège de France. He was appointed titular professor of comparative anatomy at the Jardin des Plantes in 1802. He became perpetual secretary of the Académie des Sciences in 1803, and in 1808 was appointed by Napoleon to the council of the Imperial University. He served as councilor of state in 1814. Cuvier was appointed chancellor of the University of Paris by Louis XVIII, and in 1819 became president of the committee of the interior. He was elected to the Académie Française in 1818. In 1831, Louis Philippe made him a baron and peer of France. At the time of his death he had just been named minister of the interior.

Known as the founder of the science of comparative anatomy, and sometimes of that of paleontology as well, Cuvier worked widely on scientific subjects. In his *Tableau élémentaire de l'histoire naturelle des animaux* (1798), *Leçons d'anatomie comparée* (1800-1805), and *Règne animal distribué d'après son organisation* (1816-1829), he set forth a system of classifying all animals into four great branches. He extended the principles of comparative anatomy to the study of paleontology and investigated fossil mammals and reptiles. Cuvier believed in the immutability of species and attributed the existence of different forms of animal life in different ages to the destruction of earlier species by catastrophes. This theory was vigorously opposed by Geoffroy Saint-Hilaire, who foreshadowed the modern theory of transformism.

Cuvier's other published works include *Mémoires sur les espèces d'éléphants vivants et fossiles* (1800); *Rapport historique sur le progrès des sciences naturelles depuis 1789* (1810); *Discours sur les révolutions de la surface du globe* (1815); *Mémoires pour servir à l'histoire et à l'anatomie des mollusques* (1817); *Recherches sur les ossements fossiles des quadrupèdes* (1821-1824); and *Histoire naturelle des poissons* (1829-1831).

His brother, **FRÉDÉRIC CUVIER** (1773-1838), was also a naturalist.

Consult Lee, S. B., *Memoirs of Baron Cuvier, with a List of His Writings* (New York 1833); Flourens, M. J. P., *Histoire des travaux de G. Cuvier*, 2d ed. (Paris 1845); Baer, K. E. von, "Biographie de Cuvier," *Annales des Sciences Naturelles*, 6:263-347 (1907); Lazerges, Élie, "La vie et l'oeuvre de Cuvier," *Grande Revue*, pp. 58-71, July 1932; Pilon, Edmond, "A propos d'un centenaire: le salon de Cuvier au Jardin des Plantes," *Revue des Deux Mondes*, 10:382-94 (1932); Poirier, Jean, "Georges Cuvier, second fondateur de l'université," *Revue de Paris*, 4:85-115 (1932).

CUXHAVEN, kööks'hä-fën, city, Germany, situated in Lower Saxony, on the North Sea, at the mouth of the Elbe River, 22 miles north-northeast of Bremerhaven. A seaport and summer resort, it has important fisheries and fish processing plants, shipyards, and manufactures of machinery, barrels, and nets. It was acquired by Hamburg in 1394. A new harbor was built in 1891-1895. In 1905, Cuxhaven was merged with Döse, and two years later it was chartered as a city. It was frequently bombed by Allied planes during World War II. The harbor serves as a landing for small steamers and as a port of refuge for ocean-going vessels. Cuxhaven is also

a free port, being outside the Zollverein, and the Hamburg-American Steamship Company have made it the point of arrival and departure of their mail service. Pop. (1950) 47,174.

CUYAHOGA FALLS, kà-hōg'á, city, Ohio, in Summit County; altitude 1,023 feet; on the Cuyahoga River; 5 miles northeast of Akron; on the Baltimore and Ohio, and Pennsylvania railroads. It has manufactures of rubber goods, tires, rubber-making machinery, tools, dies, medical supplies, steel and wire machinery, lumber, paper boxes and bags. The surrounding agricultural area produces celery, tomatoes, corn, wheat, oats and hay. Cuyahoga Falls was incorporated as a village in 1868, and became a city in 1920. Pop. (1930) 19,797; (1940) 20,546; (1950) 29,195.

CUYLER, John, American surgeon: b. Georgia, about 1810; d. Morristown, N. J., April 26, 1884. He entered the army as assistant surgeon in 1834, being among the first to pass the rigid examination instituted in 1833. He was actively engaged in the Creek War of 1838, and the Seminole War of 1840, and served with distinction during the Mexican War, receiving promotion as major and surgeon on Feb. 16, 1847. From 1848 to 1855 he served at West Point. As senior medical officer at Fort Monroe, during the first years of the Civil War, his services were invaluable in organizing the medical department of the armies congregated there. He served afterward as medical inspector and acting medical inspector general. He served on examining boards, and sought to uphold a high professional standard among army surgeons. He was promoted lieutenant colonel and medical inspector in 1862, brevetted brigadier general on March 13, 1865, and promoted colonel in 1876. After the war he was medical director of important departments until his retirement, June 30, 1882.

CUYLER, Theodore, American corporation lawyer: b. Poughkeepsie, N. Y., Sept. 14, 1819; d. Philadelphia, Pa., April 5, 1876. A son of the Rev. Cornelis Cuyler, member of an old Albany family and pastor of the Reformed Dutch Church of Poughkeepsie, Theodore graduated third in his class at the University of Pennsylvania in 1838. Admitted to the bar in 1841, he commenced practice in Philadelphia and soon demonstrated brilliance as an advocate. He attained national note in 1851 by his part in the defense (associated with Thaddeus Stevens and J. M. Read) at the Christiana treason trial. (See CHRISTIANA RIOT.) Appointed solicitor in Philadelphia for the Pennsylvania Railroad in 1857, he became the company's general counsel in 1869. His success in many railroad cases established his reputation as the leading corporation lawyer of his day. In 1872 he was elected delegate-at-large from Philadelphia to the Pennsylvania state constitutional convention and took an important part in its proceedings.

CUYLER, Theodore Ledyard, American clergyman: b. Aurora, N. Y., Jan. 10, 1822; d. Brooklyn, N. Y., Feb. 26, 1909. He graduated from Princeton College in 1841 and from Princeton Theological Seminary in 1846. From 1860 to 1890 he was pastor of Lafayette Avenue Presbyterian Church in Brooklyn, resigning to devote his time to literary and reform work. Dr. Cuyler's reputation as a preacher and writer was international.

He wrote *Cedar Christian* (1863); *The Empty Crib* (1868); *Heart Life* (1871); *From the Nile to Norway* (1882); *Stirring the Eagle's Nest* (1892); *Recollections of a Long Life* (1902); *A Model Christian* (1903); and *Our Christmas Tides* (1904). Besides his published volumes he wrote some 3,000 articles in magazines, many of these having been reprinted in England.

CUYO, kōō'yō, former province of Chile and Argentina, comprehending the present western Argentine provinces of Mendoza, San Luis, and San Juan. Its origin dates from the founding of the cities of Mendoza (1561), San Juan (1562), and San Luis (1596) by expeditions dispatched by governors of Chile. On the creation of the viceroyalty of the Río de la Plata (Aug. 1, 1776), Cuyo, detached from the captaincy general of Chile, was incorporated as one of its five provinces. Gen. José de San Martín (q.v.), while governor of Cuyo, prepared at Mendoza his epochal crossing of the Andes and liberation of Chile. The province was dissolved in 1820. San Juan's archbishopric is called Cuyo, and Cuyo University, opened at Mendoza in 1939, also commemorates the old province.

CUYO, island group, Philippine Islands, lying south of the island of Mindoro, and east of Palawan Island; total area, 50 square miles. The most important island of the 45 islets is Cuyo, 9 miles long; area, 22 square miles. The islands, with the exception of Cuyo, are infertile, and there is but little manufacture; the chief industries are the cultivation of rice and coconut oil. These islands are a part of the province of Palawan. Pop. (1948) 22,445.

CUYO, municipality, Philippine Islands, the capital of the province of Paragua, situated on the southwestern coast of the island of Cuyo, Cuyo group. The town is well built, and has an important trade. It is protected by a fort built on a land spit near the town. Pop. (1948) 17,492.

CUYP FAMILY, koip, the name of a family of Dutch artists:

JACOB GERRITZ CUYP, Dutch painter, commonly called the **OLD CUYP**; b. Dordrecht 1594,¹ d. ?1651. Jacob Cuyp's representation of cows and sheep, battles and encampments, are clever, but his fame rests principally on his excellent portraits which can be found at Berlin, Cologne, Frankfort, Amsterdam, Stockholm and Metz. His coloring is warm and transparent; his manner free and spirited. His portrayals of peasant groups are excellent. He was fond of introducing pet animals into his portraits. In one portrait of a family group, now in the Rothschild collection, an out-of-doors scene is represented with cows grazing here and there. These animals are depicted with the greatest accuracy.

BENJAMIN GERRITZ CUYP, half-brother of the preceding: b. Dordrecht 1612; d. 1652. In 1631 he became a member of the Guild. He painted historical and mythological scenes, in the Italian manner, with great force, crudity of color, but excellent in design and grouping.

Among his better known pictures may be mentioned *Angels at the Tomb of Christ* (Stockholm); *Adoration of the Shepherds* (Berlin); *Episode in*

¹ Some later sources say 1575.

the *History of Cambyzes* (Paris).

ALBERT, the nephew of the former and the best known of this family: b. Dordrecht 1620; d. there, 1691. He studied with his father and at first imitated him, but later developed a style of his own. In 1658, he married a wealthy widow, Cornelia Bosman, by whom he had one daughter. He sat in the high court of the province of Dordwyck, where he had considerable property, and was even considered as a candidate for the regency of Dordrecht in 1672. It is from this locality that his inspiration comes—every mood of nature is sensitively depicted in his many canvases: there are clear blue skies, pleasant meadows, quiet restful cows and horses; the people and costumes of the time—handled with sincere appreciation and fine skill in light and shade and perspective, and a homely, pleasant realism.

Examples of his animal pictures are to be found at Rotterdam, Amsterdam, Petrograd, and Brussels; of his portraits the best are at Buckingham Palace, Bridgewater Gallery, Louvre and Dresden museums. An excellent night picture is the *Night on the Banks of a River* in the Grosvenor collection. Other well-known works are *View of Dordrecht*; *Riders with Boy and Herdsman* (National Gallery, London); *Huntsman*; *Piper with Cows* (Louvre). He painted a few allegorical subjects also, but these do not equal his other works in charm and facility.

CUYPERS, koi'pērs, **Petrus Josephus Hubertus**, Dutch architect: b. Roermond, Netherlands, March 16, 1827; d. there, March 3, 1921. He studied at the Antwerp academy and under Eugène Emmanuel Viollet-le-Duc, whose neo-Gothicism he adopted and introduced in the Netherlands. Cuypers directed the restoration of the Mainz cathedral in the 1870's and won a commission to build the Rijksmuseum (1877-1885) at Amsterdam. He also designed Amsterdam's Central Station, built in the 1880's. Cuypers was not a slavish imitator of the Gothic style, and he made use of new building materials. Due to the Roman Catholic revival in the Netherlands, he was in particular demand as a designer of churches. Among these are the Church of the Sacred Heart at Amsterdam and the churches of St. James at The Hague and St. Barbara at Breda.

CUYUNA RANGE, kī-ū'nā, iron-ore belt, Minnesota, one of the principal iron-ore districts of the Lake Superior region. Located in central Minnesota, the Cuyuna Range extends from Aitkin in Aitkin County southwestward through Crow Wing County. The ore contains manganese and is mined by both the open-pit and underground shaft methods. The first shipment of ore left Crosby, the chief mining point, in 1911.

CUYUNI, kōō-yōō'nē, river, South America, about 300 miles long. It rises in the Guiana Highlands of northeastern Venezuela and flows in a generally east-southeasterly direction to the British Guiana border, of which it forms a short segment. The Cuyuni continues eastward across northwestern British Guiana and is joined by the Mazaruni just before the waters of the two rivers enter the Essequibo a short distance above the Essequibo's estuary on the Atlantic Ocean. The Cuyuni has many rapids. Gold and dia-

monds are found along its course and along its tributaries.

CUZA, kōō'zā (also spelled CUSA or COUSA), **Alexandru Ioan** (ALEXANDER JOHN), prince of Rumania: b. Huși, Moldavia, March 20, 1820; d. Heidelberg, Germany, May 15, 1873. A member of the lesser Moldavian aristocracy, he studied abroad from 1834 to 1839, part of the time in a military school in Paris, and returned home an ardent nationalist imbued with Western ideas. He was imprisoned for a short time for taking part in the abortive revolt in Waldachia in 1848, but from 1850 to 1857 he was prefect of Galati, after which he entered the army, quickly rising to the rank of colonel.

The two principalities of Moldavia and Walachia had been autonomous since 1829, but the Turkish sultan, their nominal suzerain, and Austria opposed their being unified, which was favored by France, Great Britain, and Russia. The unionists won the elections of September 1857 in the principalities, and in 1858 a conference of the powers at Paris "united" them, although each principality was to have a separate government and choose its own prince. Cuza, who had become minister of war in 1858, was known as a strong advocate of union, and although many unionists of both principalities preferred union under a foreign prince, they circumvented the declared intention of the powers by electing Cuza prince of Moldavia, at Bucharest on Jan. 17, 1859, and prince of Walachia, at Jassy on February 5 following. He assumed the title Alexandru Ioan I and was recognized immediately by Napoleon III, subsequently by the other powers.

Modern Rumania was born in 1862, when the sultan recognized the union of Moldavia and Walachia, and from that year the prince instituted a program of liberal reform, executing a coup d'état in March 1864 to break the conservative opposition. In August 1864 he decreed a far-reaching land reform abolishing the remaining vestiges of feudalism. Nevertheless, his growing success in concentrating power in his own hands aroused the opposition of the powers and the Turks, his reforms alienated the landed aristocracy, and the country entered a period of severe financial difficulty. On Feb. 23, 1899, a group of army conspirators forced their way into the palace, compelled the prince to abdicate, and conducted him to the frontier. He lived thenceforth in exile, being succeeded by a German prince, Karl of Hohenzollern-Sigmaringen, who reigned as Carol I.

CUZCO, kōōs'kō (sometimes Cusco), department, Peru. It lies partly in the lofty mountain plateau of southern Peru, and partly in the rain-forest jungle on the eastern slope of the Andes. Cuzco Department is bounded by the Department of Loreto on the north, Madre de Dios and Puno on the east, Arequipa on the south, and Apurímac, Ayacucho, and Junín on the west. The city of Cuzco is its capital.

A curious fact about the Department of Cuzco is that, although not far back from the Pacific, its drainage almost all flows into one part or another of the Amazon system and thence into the Atlantic. The southerly and more populous part of the department is in the high Andes. Lofty peaks covered with snow and glaciers abound here, offering some of the most magnifi-

cent scenery on earth. Agriculture of many types, chiefly food crops, has been practiced for many centuries in the inter-Andean valleys. Much of the tilled land is on the slopes of the mountains where the Incas' subjects long ago constructed marvelous stone terraces in order to enlarge their tillable area. These terraces and the accompanying irrigational works constitute one of the major glories of the department.

Higher up (above 12,000 feet or so) there is plentiful good pasturage for llamas, vicuñas, sheep, and other animals, some of native origin, others of European.

The people are very largely pure Indians who speak mainly Quechua, the tongue of the Incas. There are also many thousands of mestizos (mixed Indian and Spanish blood) who speak good Spanish as well as Quechua. In the forested northern portion of the department there are uncounted Indian stocks of lower culture who speak dialects of their own in addition to the official Spanish language.

For the most part, the atmosphere of this department, homeland of the Incas, is Indian, with, however, much admixture of Spanish and other European elements. The relatively small pure, or nearly pure, Spanish-blooded class speaks Spanish of singular, if sometimes archaic, purity. Area 55,731 square miles; pop. (1950 est.) 672,383.

PHILIP AINSWORTH MEANS,
Historian and Author.

Revised in Editorial Offices, ENCYCLOPEDIA AMERICANA.

CUZCO (sometimes **CUSCO**), city, Peru, capital of Cuzco Department. It lies in the bottom of the Cuzco Valley at an altitude of about 11,380 feet. The city is at the junction of the Huatanay and Tulumayo rivers whose waters flow into the Urubamba farther east, whence they flow into the Amazon.

With the possible exception of certain cities in Mexico and Central America, Cuzco is unlike any other city in the world, being the joint product of Indian and Spanish cultural traditions—with the Indian contribution largely dominant. Begun by the earliest Incas probably before 1200 A.D., the city still rests for the most part on Incaic masonry of several styles and periods. Above the first floors of the buildings rise the Spanish-style upper stories, of masonry, adobe, and carved wood, the last being chiefly represented by beautiful overhanging balconies. As the plan of the present city is mainly derived from the Incaic period, it lacks the rectangularity usually distinctive of Spanish-planned towns. The streets are narrow and tortuous on the whole, but exceedingly picturesque. The Plaza Mayor of today is but a part of the Holy Square of Incaic times, where much of the rich ceremonial of the Incas was enacted. Upon its sides stand the great and beautiful cathedral (begun under Pizarro), the university, and other noteworthy buildings of Spanish style but containing more or less Incaic stonework.

Many of the vast mansions, heavily tintured with Spanish influence dating from the advent of Pizarro in 1533, were originally Incaic palaces. In like manner, many of the numerous churches rise from Incaic lower parts. The Church of Santo Domingo, for instance, though now seemingly a Spanish-style building of impressive beauty, contains much superfine Incaic masonry of the ancient Temple of the Sun. Other examples of

such felicitous blending of two great cultures abound in many parts of Cuzco. They explain why it has an almost unique charm which seldom fails to captivate visitors.

Over the northern edge of the city hangs a high hill crowned by the mighty stone citadel of Sacsahuamán. Its southern walls are built in the style distinctive of the Incas in their latest reigns. But the very massive cyclopean northern walls, with entrant and re-entrant angles that Sébastien Vauban would have envied, are in a style so different and seemingly so much older that it was long thought that they were pre-Inca. Thanks chiefly to the work of Dr. Luis Valcárcel, we now know that all of Sacsahuamán is late Inca.

With reason, Cuzco is hailed as "the archaeological capital of South America." It has today good hotels, all modern conveniences, and a vigorous modern life in general. Pop. (1950 est.) 55,634.

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PHILIP AINSWORTH MEANS,
Historian and Author.

CY PRES, sē'prā' (also CYPRES), a legal term from the Old French *si pres*, meaning as nearly [as possible]. In English and Scots law and the law of some states of the United States, if a gift legal in form cannot be administered exactly as the testator specified, or if the testator did not specify definitely (as in a bequest for the general relief of the poor), the gift may be applied cy pres, "as nearly as possible," to the intention of the testator. Cy pres is a doctrine of the early common law, by which, if gifts were made for charitable uses that were illegal or contrary to public policy, or that could not be carried out, the king, as general supervisor of charities, or the chancellor acting for him, could devote them to other charitable purposes cy pres as intended in the original gift.

CYANAMIDE, sī-ān-ām'id or sī-ān'a-mīd. H_2CN_2 , is the free acid of the commercial salt, calcium cyanamide. It is prepared mainly as an intermediate in the manufacture of dicyandiamide and thiourea. In aqueous solutions, cyanamide is relatively stable at pH 4 to 6, but it polymerizes to dicyandiamide, $\text{NH}_2\text{C}(:\text{NH})\text{NHCN}$, in weakly alkaline solutions, and hydrolyzes to urea, NH_2CONH_2 , in strongly acid or strongly alkaline solutions. With hydrogen sulfide, cyanamide forms thiourea, NH_2CSNH_2 . Cyanamide reacts with ammonium nitrate to form guanidine nitrate, $\text{NH}_2\text{C}(:\text{NH})\text{NH}_2 \cdot \text{HNO}_3$.

CYANIC AND ISOCYANIC ACIDS, sī-ān'ik, ī-sō-sī-ān'ik. Neither of these substances is capable of continuous existence at ordinary temperatures, but both are important organic compounds. Cyanic acid is structurally $\text{HO}-\text{CN}$ and isocyanic acid is $\text{O}=\text{C}=\text{NH}$, the two existing in equilibrium as a liquid at temperatures below the freezing point of water. Cyanic acid, on warming, polymerizes to cyanuric acid, $\text{C}_3\text{H}_3\text{O}_3\text{N}_3$, and to another substance of the same composition and molecular weight but of different structure, known as cyamelide. The latter is converted by alkalis to salts of cyanuric acid.

Depolymerization of cyanuric acid is brought about by dry distillation, and the resulting cyanic acid can be condensed below 0°C.

Cyanic acid is an important reagent in organic syntheses, being liberated from its salts by weak acids such as acetic acid, and reacting immediately to add the $-\text{CONH}_2$ group by replacement of active hydrogen. For example, hydrazine, NH_2NH_2 , is converted by cyanic acid to semicarbazide, $\text{NH}_2\text{NHCONH}_2$. Alkali cyanates can be readily prepared by oxidizing the corresponding cyanides with lead oxides, or by heating urea, NH_2CONH_2 , with alkali carbonates. Cyanic acid is of great historical importance since the first carbon compound of natural origin, urea, was synthesized by Friedrich Woehler in 1828 by the rearrangement of ammonium cyanate, NH_4OCN . This salt was obtained by the oxidation of an alkali cyanide to a cyanate and the formation of ammonium cyanate from it. There are no true organic cyanates.

Isocyanic acid, however, is represented by a number of organic derivatives which are valuable and versatile reagents. They may be made by the action of phosgene on primary amine hydrochlorides. Alkyl isocyanates, $\text{R}-\text{N}=\text{C}=\text{O}$, are employed in the identification of alcohols and primary and secondary amines, and also may be converted into substituted amino acids of the general formula $\text{R}-\text{NH}-\text{CO}_2\text{H}$. Isocyanates are intermediates in the conversion of acids to primary amines, a process by which carbon chains are shortened by the loss of an atom of carbon at each step, thus giving definite evidence of structure. Organic isocyanates are being extensively used in the production of a type of synthetic rubber known as polyester elastomers.

In the field of organic chemistry, many oxygen-containing compounds have sulphur analogues. This is true of cyanic and isocyanic acids and their derivatives. Compounds related to thiocyanic acid, HSCN and isothiocyanic acid, HNCS , are common organic chemicals. Thiocyanic acid is a solid, stable below 0°C. or in dilute solution, but which polymerizes to an insoluble yellow solid when heated. Potassium thiocyanate, KCNS , is made by heating potassium cyanide with sulphur, and is a valuable analytical reagent and common chemical. Ammonium thiocyanate is a by-product in the purification of coal gas, and is also important industrially. Organic thiocyanates are valuable insecticides, while the organic isothiocyanates occur in many plants, allyl thiocyanate or allyl mustard oil being present as a glucoside in mustard seeds. The mustard oils may also be synthesized from primary amines and carbon bisulphide in the presence of a metallic salt which gives an insoluble sulphide. These derivatives are very versatile reagents in organic syntheses.

W. T. READ.

CYANIDES, *si'á-nidz* or *si'á-nidz*. The term cyanide is derived from the Greek *κυανός*, meaning blue, since complex double cyanides of iron and alkali metals have an intense blue color. All cyanides are characterized by the $-\text{CN}$ group in which three of the four valences of carbon are satisfied by trivalent nitrogen. Compounds made up of one or more of these groups and metals are commonly known as "inorganic cyanides," but in the strictest sense of the chemistry of carbon compounds all cyanides are organic compounds.

Inorganic Cyanides.—Hydrocyanic Acid.—All cyanides may be regarded as derivatives of hydrocyanic acid, HCN (also called prussic acid or hydrogen cyanide), although this substance is more commonly made from cyanides. Being a deadly poison, hydrocyanic acid is an efficient fumigant in horticulture, flour mills, and the holds of ships. It is also a valuable reagent in organic syntheses, particularly in the production of synthetic fibers and plastics. Hydrocyanic acid is a volatile liquid, boiling at 26.1°C., and is handled in cylinders and drums, also for some purposes in water solution. It can be made by silent electric discharge through a mixture of acetylene and nitrogen, but it is commonly prepared by the action of sulphuric acid on an alkaline cyanide, or more recently, by heating ammonia and methane in the presence of a catalyst and by the catalytic dehydration of formamide, a methanol product. Some hydrocyanic acid is made by heating beet sugar residues, and this product is generally converted to sodium cyanide for the mining industry.

Sodium and Potassium Cyanides.—The most widely used of all cyanides is sodium cyanide, NaCN . For some purposes potassium cyanide, KCN , is preferred, although it is more expensive. [Alkali cyanides were originally made by heating alkaline ferrocyanides, but this process is now entirely of historic interest.] There are two commercial methods for making sodium cyanide. If a crude mixture of sodium and calcium cyanides is all that is required, commercial calcium cyanamide, CaNCN , an electric-furnace product containing considerable carbon, may be fused with salt. A purer grade of sodium cyanide, employed in the production of high-grade chemicals, results from the passage of ammonia through a mixture of metallic sodium and charcoal at a high temperature (600°–800°C.). Sodamide and sodium cyanamide are intermediate products.

Sodium cyanide is not only a source of hydrocyanic acid, it is an important heavy chemical employed in the cleaning, plating, and recovery of metals. Both sodium and potassium cyanides are common ingredients of electroplating baths since they enter into the formation of complex double cyanides, and thus make possible the liberation of the ions of heavy metals in the proper concentration to produce a satisfactory deposit. Metals plated from cyanide baths include copper, cadmium, gold, and silver. Cyanides of the alkali metals are included in one of the major processes for extracting gold and silver from their ores, the finely ground ore being treated with a dilute cyanide solution. The formation of complex ions such as $\text{Ag}(\text{CN})_2^-$ and $\text{Au}(\text{CN})_2^-$ causes the silver and gold to dissolve, oxygen from the air being necessary to the process. See also GOLD, METALLURGY OF.

Other Inorganic Cyanides.—The most important of these are double alkali iron cyanides, which are regarded as derivatives of hydroferrocyanic acid, $\text{H}_4\text{Fe}(\text{CN})_6$ and hydroferricyanic acid, $\text{H}_3\text{Fe}(\text{CN})_6$. Potassium ferrocyanide, $\text{K}_4\text{Fe}(\text{CN})_6$, was made formerly by heating iron and potash with all sorts of organic nitrogen materials such as leather scrap and dried blood. The German term *Blutlaugensatz* or "blood alkali salt," which is applied to the iron double cyanides, is derived from this practice. A very common source of this ferrocyanide is the hydrous iron oxide in which quantities of cyanides have been formed as coal gas is passed through the

purifiers, hydrocyanic acid being formed in appreciable quantities as coal is carbonized. Boiling with lime and treatment of the resulting calcium ferrocyanide with potassium carbonate solutions are the steps by which the desired product is made. Oxidizing agents, such as chlorine, convert this material to potassium ferricyanide, $K_3Fe(CN)_6$, which is also a valuable industrial chemical. The blue pigments, Prussian blue and Turnbull's blue, are double cyanides of ferrous and ferric iron, the former being a ferrous ferricyanide, the latter a ferric ferrocyanide. A considerable amount of blueprint paper is made by coating white paper with a solution containing ferric ammonium citrate and potassium ferricyanide. Light converts the former to the ferrous salt which forms a blue precipitate. The protection afforded by the lines of drawing prevents this conversion, and on washing the soluble products from the paper the final result is that of white lines on a blue background.

Organic Cyanides.—The most common organic cyanides are the nitriles, in which one hydrogen of a hydrocarbon is replaced by the $-CN$ group. They are most commonly made by the action of an alkaline cyanide and an alkyl halide. For example, $KCN + C_2H_5Cl = KCl + C_2H_5CN$. Olefins from petroleum and ammonia react at high temperatures to produce nitriles. Most nitriles are converted to the corresponding acids, this being a common method of synthesis. Hydrolysis of a nitrile in the presence of an acid proceeds in steps with the final formation of an acid containing one more carbon than the original organic halide, $R-CN$ to $R-CO_2H$. In a basic solution the salt of the acid is formed. An important nitrile is an unsaturated compound, vinyl cyanide or acrylonitrile, $CH_2=CH-CN$, which results either from the dehydration of ethylene cyanhydrin (made from ethylene oxide and hydrogen cyanide) or by the catalytic addition of hydrocyanic acid to acetylene. Acrylonitrile and acrylic esters, in whose synthesis hydrocyanic acid is used, are important starting substances in the manufacture of a variety of synthetic rubbers and in a number of textile fiber and plastics processes.

Hydrocyanic acid is regarded as having the structure, HCN , but its isomer, isocyanic acid, has derivatives in which a metal atom or organic radical is attached to the nitrogen rather than the carbon atom. Some authorities give silver cyanide the formula, $AgNC$. Organic isocyanides are toxic liquids with very penetrating and disagreeable odors. Silver cyanide and alkyl halides produce isonitriles. Primary amines with chloroform and an alkyl halide also form isonitriles such as CH_3NC , known as methyl isocyanide. These substances show unsaturation on the carbon atom alone, and add halogens, sulphur, hydrogen chloride, and other substances.

W. T. READ,

Chemical Adviser, Research and Development Division, General Staff, Department of the Army.

CYANINS AND ANTHOCYANINS, *si'-ân-thô-si'-ân-nînz*, blue and red coloring matters of flowers and berries. The anthocyanins are related to the flavones, also parent substances of many natural colors. Both contain heterocyclic rings. Synthetic cyanin dyes are derived from quinidine, and are particularly important as *rs* of photographic emulsions.

CYANOGEN, *si'-ân'-ô-jên*, C_2N_2 , is a poisonous gas, liquefying at $-21^\circ C$. This substance is also formed by heating mercury and silver cyanide and also from the decomposition of unstable cupric cyanide, $Cu(CN)_2$; cuprous cyanide, $CuCN$, remaining. It may also be produced from ammonium oxalate or oxamide by the powerful dehydrating agent, phosphorus pentoxide. It is present in small concentrations in coal gas, along with much larger amounts of hydrocyanic acid, but in the terminology of the gas industry both are often referred to as cyanogen. Cyanogen may be regarded as the nitrile of oxalic acid, $(CN)_2$ going to $(CO_2H)_2$. It has no commercial use, but is interesting to chemists because of its resemblance to chlorine, the substance being referred to as a pseudohalogen or halogenoid. When chlorine reacts with bases, chlorides and hypochlorites are formed. $Cl_2 + 2NaOH = NaCl + NaClO$. In the same way cyanogen forms cyanides and isocyanates. $(CN)_2 + 2NaOH = NaCN + NaNCO$. A polymer, paracyanogen, $(CN)_x$, is formed by the action of light on cyanogen, and may be decomposed into cyanogen when it is heated.

Cyanogen may be thought of as the parent substance of cyanides of all types, although very few are made directly from it. Several, however, bear the name, such as cyanogen chloride, $CICN$ and cyanogen bromide, $BrCN$, both being made by the action of the corresponding halogens on an alkali cyanide. Cyanogen bromide was one of the toxic chemicals used in World War I.

W. T. READ.

CYANOSIS, *si'-ân-nô'sis*, a term broadly applied to a bluish tint of the skin and mucous membranes. The word is derived from the same Greek word, meaning blue, which appears in cyanogen, cyanides, cyanic acid, and similar compounds, but has no relation to the effects of any of these compounds. The most common cause of cyanosis is a deficiency in the oxygenation of blood in the lungs, and in the strictest medical sense this is the only cause of true cyanosis. This condition may be due to structural defects in the circulatory system, leading to venous blood reaching the arteries without access to the lungs, a defect that is the cause of the appearance in children—commonly called "blue babies"—of a blue coloration of the skin. This has been relieved in a number of cases by very delicate surgery. Temporary cyanosis may be caused by choking or excessive coughing, and also by various types of poisoning by drugs or chemicals.

A false cyanosis results from the deposition of abnormal pigments in the capillaries, one instance being that of a workman who drank considerable amounts of aniline from a bottle supposed to contain coffee. In this case a blue coloration remained long after recovery. The same symptom results from the absorption of toxic materials such as hydrogen sulphide from the intestines causing the formation of a sulphur derivative of hemoglobin. Influenzal septicemia of a very grave nature is accompanied by an appearance of a heliotrope color similar to that of cyanosis.

CYANURIC ACID, *si'-ân-nû'rîk*, an organic compound, $C_3H_3O_3N_3$, formed by the polymerization of cyanic acid, HCN . It also results from the dry distillation of urea. Cyanuric acid is an equilibrium mixture of two substances, one of which contains a six-membered ring of alternate

carbon and nitrogen atoms, each carbon atom being attached to a hydroxyl or OH group (enulic), and other containing a similar ring with a hydrogen atom on each nitrogen and an oxygen on each carbon (ketonic). Cyanic acid also polymerizes to cyamelide, which has the same percentage composition as cyanuric acid, but whose six-membered ring is made up of alternating carbon and oxygen atoms with an amino or $=NH$ group attached to each carbon. Cyamelide reacts with alkalis to give salts of cyanuric acid. There are several complex compounds made up of conjugated six-membered nitrogen-carbon rings which are related to cyanuric acid. Cyanuric acid, when heated, yields a vapor which may be condensed at a low temperature to cyanic acid.

Alkyl isocyanates, or derivatives of isocyanic acid, $HNCO$, polymerize to substances often called esters of isocyanuric acid, but which are in reality nitrogen substitution products, as shown by the formation of primary amines on hydrolysis.

W. T. READ.

CYAXARES, si-āk'sā-rēz, king of Media: d. about 585 B.C. Although the broad outline of his life is reasonably clear, the chronology and details for the most part rest on semilegendary sources. It is certain, however, that the Median kingdom reached its apogee under Cyaxares. His father, Phraortes, apparently was killed in a struggle against his Assyrian overlord, Ashurbanipal, and Cyaxares succeeded him, according to tradition, about 625 B.C. After an invasion of Media by Scythian nomads from the steppes, Cyaxares renewed the struggle with the Assyrians, who were now being assailed from all sides. He entered an alliance with Nabopolassar, the revolted Assyrian governor of Chaldea who founded the Neo-Babylonian Empire, and together with Scythian allies they captured Nineveh in 612, bringing the Assyrian Empire to an end.

Cyaxares conquered the northern part of the Assyrian territories for himself and extended his empire westward into Urartu (Armenia) and beyond, which brought him into conflict with Alyattes, king of Lydia, about 590. This struggle ended in a stalemate—traditionally because an eclipse of the sun during a battle on the river Halys (the modern Kızıl Irmak), May 28, 585, was accepted as an omen—and the Halys remained the boundary between the two kingdoms.

Cyaxares was succeeded by his son Astyages, last independent king of Media, who was overcome by Cyrus the Great of Persia. The son of Nabopolassar, Nebuchadnezzar II, is said to have built the Hanging Gardens of Babylon for a daughter of Cyaxares who was one of his wives.

CYBELE, sīb'ē-lē (also called DINDYMENE, dīn-dī-mē'nē, or AGDISTIS, āg-dis'tis), the Great Mother goddess of the ancient Phrygians in Anatolia, mother of the gods and men, goddess of the earth, fertility, and wild nature. Her attendants were the Corybantes, who accompanied Cybele on her wanderings with wild dances and music.

Cybele was worshipped with Attis (Atys), her youthful lover, with whose annual death and resurrection were connected the death and resurrection of nature in winter and spring. The cult of Cybele and Attis, embodying the female and male duality, corresponds to the cults of Isis and Osiris in Egypt, Ishtar and Tammuz among the Babylonians and Assyrians, and Venus and

Adonis in the West. In Anatolia, Cybele and Attis were guardians of graves, and a belief in immortality was associated with their cult from early times.

Cybele's principal shrine, at Pessinus in Galatia, contained a stone that had fallen from heaven, presumably a meteorite. Her name Dindymene derived from a mountain sacred to her near Pessinus, Mount Dindymus; the name Agdistis, from the rock Agdus on that mountain. In historic times Cybele had both priests, who were eunuchs, and priestesses. Her festival, celebrated about the spring equinox, was accompanied by noisy, orgiastic rites, in emulation, it was thought, of the wild fervor of the Corybantes, although the Corybantes may well have been mythical projections of Cybele's dancing priests.

By the 5th century B.C., the cult of Cybele had spread from Asia Minor to Thrace and Greece, where she became identified with Rhea, Ge, and Demeter. In 205–204 B.C., in response to a Sibylline oracle which promised that Hannibal would be driven from Italy if Cybele were brought to Rome, the stone from her shrine at Pessinus was transported to Rome and a temple was built for her on the Palatine. Her cult was adopted by the state, and from Rome under the empire it spread through the provinces, particularly in Gaul and Africa. In the Roman world Cybele was identified with Tellus, Ceres, Ops, and Maia, and was known as the Great Idaean Mother of the Gods. Cybele was cherished by the common people, especially the women, and her cult offered stubborn resistance to the spread of Christianity.

Cybele is usually represented enthroned, wearing a castellated crown. Garlands and fruits, the cymbals and drums used in her rites, and her favorite animal, the lion, often appear with her.

CYBERNETICS, sī-bēr-nēt'iks, a word coined by Norbert Wiener to describe the complex of sciences dealing with communication and control in the living organism and in the machine. When Wiener introduced the term, which is derived from the Greek κυβερνήτης, meaning governor or steersman, he was unaware that it had already had a considerable history and that it had been used more than a century before by André Ampère to cover the purely governmental side of such a theory, in the positivistic classification of scientific theories. The modern term was introduced because of the need to describe comprehensively a group of phenomena having a real community of ideas and appropriate methods of study, but belonging to conventionally different disciplines.

Cybernetics includes the theory of information and its measurement; the concept of communication as a statistical problem in which messages not sent play an equal role with messages sent; the theory of the statistical prediction of sequences of events distributed in time; the theory of the relation between message and noise and their separation by wave filters; the theory of apparatus for control, and its design and application to servomechanisms; electrical computers; and the automatic factory. It includes also the theory of apparatus that retains information in a sort of "memory" and that adapts its performance to improve its own efficiency by a sort of "learning" process; and the application of this idea to the lower animals and to man and his society, to include the theory of Gestalt psychology. It may be extended to the study of physical

apparatus by which we may recognize Gestalt. Closely related to it is the study of communication nets with variable characteristics, and of the ways in which such nets settle down to an equilibrium or quasi-equilibrium of performance.

This congeries of sciences developed during World War II out of the need for putting mathematical and other scientific talents to work on practical problems of military design, which had not until then been considered to be of a purely scientific nature. This need was closely related to the further one of organizing such processes as the tracking down of airplanes, which by their very speed and complexity eluded the existing types of human intervention, through the use of automatic, mechanical, or electronic auxiliary devices. Thus a field of investigation covering not only such mechanisms, but also their archetype, the brain and the nervous system, came into being and was treated by Wiener in his book *on Cybernetics, or Control and Communication in the Animal and the Machine* (1948). This book was the outgrowth of war work done by Julian Bigelow and the author on automatic predictors for antiaircraft fire, of a long-standing interest in computing machines, and of certain suggestions made by Arturo Rosenblueth concerning the functioning of the human element in mixed human and mechanical fire-control systems.

The cybernetic nexus of disciplines has interested neurophysiologists, psychologists, and communication engineers, and there are writings emanating from all these groups which must be considered to be essentially of a cybernetic nature. In pure mathematics, it has had the greatest repercussions on the students of probability.

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NORBERT WIENER,
Professor of Mathematics, Massachusetts Institute of Technology.

CYCADALES, sîk-â-dâ'lêz (the CYCADS, sî'kâdz), an order of plants, including a single family (Cycadaceae, the cycas or sago palm family) of gymnospermous, tree-fernlike or palmlike, cone-bearing plants with a crown of large, leathery, pinnate leaves, and tuberous, subterranean or columnar stems. The nine genera contain 100 species found mainly in the tropical and warm temperate parts of the Old and New Worlds. They rarely grow together in dense groups forming forests.

The tuberous stems of the low-growing forms (*Bowenia*, *Stangeria*, *Zamia*) are either subterranean and occasionally only a few inches long, or short and often branched with the leaf bases sometimes scaling off and the crowns of leaves and cones appearing close to the ground. The columnar stems (*Dioon*, *Ceratosamia*, *Microcycas*, *Cycas*) are erect, rarely branched, tall if more than six feet high, sometimes partly (upper portion) or entirely covered by armored leaf bases. The Australian species *Macrozamia hopei* may attain 60 feet in height, and the Cuban species *Microcycas calocoma* may reach 30 feet to the crown of leaves. As cycads are slow-grow-



Fig. 1. Mature plant of *Cycas rumphii*, showing young megasporophylls at the apex, followed by a whorl of foliage leaves, a whorl of old sporophylls with nearly ripe seeds, and another whorl of foliage leaves.

ing plants, some trunks may grow for centuries before acquiring their full height and diameter.

In section, most stems lack distinct growth rings and show a large cortex and central pith surrounded either by a simple ring of collateral bundles with scanty secondary growth by a single cambium (monoxyle type as in *Zamia*, *Dioon*, *Ceratosamia*), or by numerous concentric layers of wood resulting from a series of successively formed, peripheral, ringlike cambia, and a very broad cortex (polyxyle type as in *Cycas*, *Encephalartos*, *Bowenia*). Growth rings of this

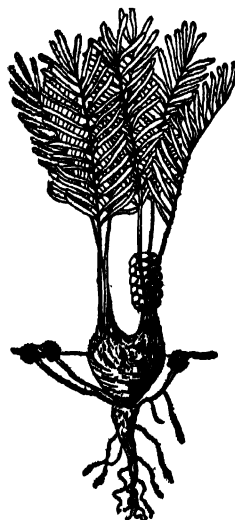


Fig. 2. Mature plant of *Zamia* with female cone.

kind are formed at irregular intervals, sometimes lasting 10, 20, or more years, as in *Dioon*.

Leaves.—The large (two inches to nine feet), simply or doubly pinnate, leathery leaves are perennial, xerophytic, and spirally arranged in a dense crown. Normally either the whole leaf or part of it shows erect vernation, but in *Cycas* the whole leaf is circinate.

The leaves of the various genera can readily be identified by their characteristics. Only the leaflets of *Cycas* and *Stangeria* have a midrib, but those of *Cycas* lack side veins whereas in

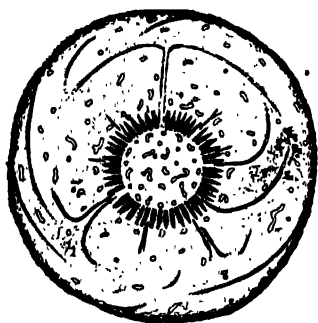


Fig. 3. Transverse section of the stem of *Zamia floridana*, showing large pith and cortex, and the narrow zone of wood. Leaf traces are also shown.

Stangeria side veins branch off from the midrib. The bipinnate leaf of *Bowenia* differs from the usual pinnate type of the other genera. Most species of *Macrozamia* have a gland at the base of each leaflet. In *Dioon* the base of the leaflet is as wide or wider than the middle of the leaflet. The leaflets of *Microcycas* are reflexed on the rachis. The leaflets of *Ceratosamia* are long, narrow, tapering gradually to a point, and always entire, whereas they are rarely entire in *Zamia* and very jagged in some species of *Encephalartos*, or the lower ones are reduced and, near the base, are modified into spines.

The leaflets seen in young plants are usually quite different from those in older plants, which may be 50 or more years old. In some species new leaves are formed every year, in others every two years, while the rest of the leaves of each crown persists for several years. When the plants produce cones, new leaves are usually

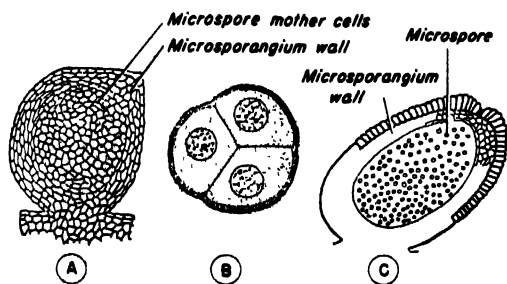


Fig. 4. Microsporangium of *Zamia*. (A) longitudinal section showing microspore mother cells; (B) spores resulting from division of microspore mother cell; (C) mature microsporangium.

formed during the following year or after a period of dormancy of several years.

Important anatomical characteristics of leaves include mesarch leaf trace bundles, the presence in each leaf of two collateral or concentric bundles at the base, the segments showing either an unbranched or variously branched bundle or a group of numerous parallel bundles, and typically gymnospermous stomatal structures and epidermal cells (see the section *Fossil Cycads*). All organs of cycads contain mucilage ducts.

Reproduction.—The cones (strobili) are terminal, lateral, or axillary, unisexual, either pollen (male, microsporangiate) or carpellate (female, megasporangiate), and are always found on different plants (absolutely dioecious). The pollen cones are always compact and are made up of scales (microsporophylls) bearing from 25 to more than 1,000 pollen sacs (microsporangia) on their lower sides. The unilocular, eusporan-

giate microsporangia are grouped radially in sori reminiscent of ferns. Each sorus contains 5, 4, 3, or 2 (even 1) microsporangia. Pollen cones vary in size from $\frac{1}{4}$ inch to 35 inches (8 inches in diameter), and in number from few to over 100 in *Macrozamia moorei*. Seed or carpellate cones, composed of numerous peltate or spatulate scales (megasporephylls) bearing laterally two erect ovules oriented toward the base, are found in eight of the nine genera. *Cycas* differs from these, since its pinnate megasporephylls look like small vegetative leaves bearing two to eight ovules laterally near their base, covered with yellowish hairs while young. These megasporephylls are congregated

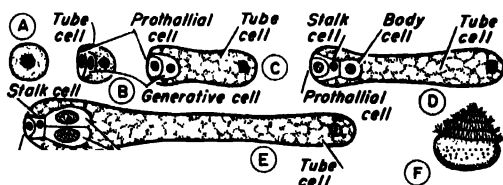


Fig. 5. Stages in the development of microgametophyte of *Zamia*. (A) (B) stages found in microsporangium; (C) (D) (E) stages while pollen tube is growing through nucellus: (A) microspore; (B) pollen grain (or three-celled microgametophyte) at time of liberation; (C) pollen grain shortly after germination; (D) stalk cell and body cell derived from generative cell; (E) body cell has divided into two antherozoids; (F) mature antherozoid.

near the apex of the stem, which may continue to grow vegetatively.

The seed cones of cycads are the largest known in the plant kingdom. They may be over three feet long and weigh nearly 90 pounds, as in the Australian species *Macrozamia denisonii*. In *Cycas rumphii*, as in some other species, young male cones and female sporophylls emit a strong and unpleasant smell for many days, resulting probably from metabolic processes during rapid growth.

The ovules, mostly one to two inches long, contain a central tissue, nucellus, surrounded entirely by a thick, vasculated integument composed of three layers (two fleshy layers with a stony

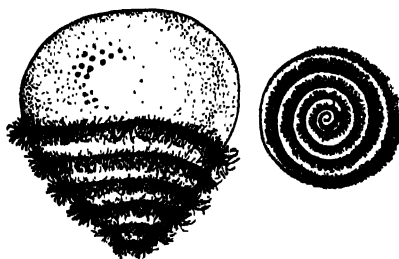


Fig. 6. Mature antherozoids.

layer between) except for the terminal narrow passageway (micropyle) leading to the pollen chamber. The megagametophyte develops deep in the tissue of the nucellus from a megaspore mother cell. The number of archegonia (egg-bearing structures) varies from three to more than 200 in *Microcycas*. The formation of archegonia resembles that of ferns, but the archegonia are deeply embedded and their eggs are surrounded by a distinct jacket of nutritive cells. The eggs of cycads are the largest known among plants, those of the Mexican species *Dioon edule* being up to three sixteenths of an inch long and about a third of that in diameter.

The pollen grains are smooth, and pollination

is generally accomplished by wind. No reliable reports on insect pollination are available. Pollinating liquid appearing through the micropyle conveys pollen grains to the pollen chamber. Two large sperms, visible to the naked eye (200 microns in diameter and 275 microns in length in *Dioon edule*) and equipped with a spiral band of cilia, are formed in the pollen tube and discharged

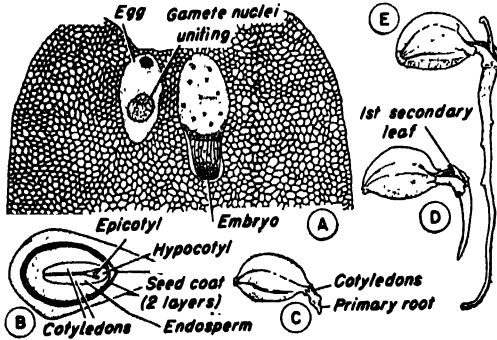


Fig. 7. Development of megagametophyte of *Zamia* and germination of seed. (A) apical portion of megagametophyte; (B) longitudinal section of mature seed; (C) (D) (E) germination of seed and development of young sporophyte

into the archegonial chamber, whence they enter the neck of the archegonia, lose their cilia, and bring about fertilization of the egg. Unlike other cycads, which have two sperms in each pollen tube, the Cuban endemic *Microcycas calocoma* usually produces 16 sperms per pollen tube.

After fertilization, the zygotic nucleus divides repeatedly by free-nuclear divisions until 500 to

ophyte, leaving a cavity, the long, coiled suspensor moves the embryo forward as far as possible. Although several embryos may develop (simple polyembryony) at first, one eventually survives the others, forms cotyledons, and thus becomes the embryo of the seed.

The mature seed contains a single, centrally situated, dicotyledonous embryo surrounded by endosperm (megagametophyte) and testa. The fleshy, outer seed coat is white or creamy, red, orange-red, or orange. Below the fleshy layer is a hard, stony layer, and inside this is the inner vasculated fleshy layer which gives up its cell contents to the female gametophyte and embryo, and becomes a dry, papery membrane. The nucellus remains as a dry, papery cap underneath the top of the inner layer.

The embryo extends throughout the length of the seed, has two somewhat unequal cotyledons, a single leaf accompanied by one or more scale leaves, and its long suspensor coiled and crowded against the micropylar end. In the central region of the embryo appears a conspicuous structure, the coleorhiza. Being essentially protective, it becomes very hard as the embryo reaches full growth. Upon germination, the coleorhiza is the first to appear on the outside. The root tip follows by digesting its way through the base of the coleorhiza, and finally the cotyledons come

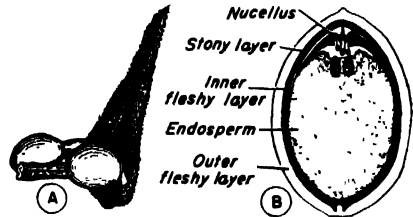


Fig. 9. Young embryo and germination of seed in *Dioon edule*. (A) young embryo with numerous nuclei, note absence of separating walls; (B) later stage, walls have appeared at bottom; (C) ripe seed, embryo embedded in endosperm; (D) embryo with root and first leaf pointing up, cotyledons remaining in seed; (E) seedling with first leaf, the seed often remaining attached for a year or more

through. Cycad seeds do not undergo a resting stage and do not retain their vitality very long. The seedling usually has a fleshy primary root giving rise to secondary branches, a small, hidden stem bearing the first true leaf, and scale leaves.

Roots.—Although in seedlings the primary root may be larger than the stem, in mature plants the stem becomes larger than the root, which may attain considerable length. In addition to the regular geotropic roots, all cycads may have erect (apogeotropic) roots. These fork profusely, forming coralloid masses above ground. Anatomically they are like normal roots, but bacteria apparently enter near the tip and induce distortion. Here a blue-green alga, *Anabaena*, enters and multiplies rapidly until a blue-green zone is formed between the vascular cylinder and the epidermis. Erect roots are found in nearly all seedlings, and are more common in greenhouse plants than in the field.

Living Genera.—Commonly, nine living genera are recognized. Recent explorations have disclosed previously unknown endemic species in Honduras, Colombian Amazonia, and South Africa. Five of these genera are eastern in distribution, and the remaining four are western.

Eastern Genera.—(1) *Cycas*, whose 19 species are all columnar trees, occupies the largest

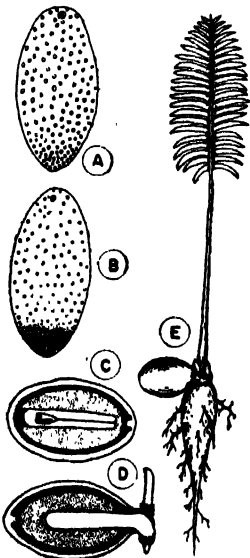


Fig. 8. *Dioon edule*. (A) megasporophyll with two ovules (megasporeangia); (B) longitudinal section of ovule.

1,000 free nuclei are formed. Later, walls are developed between the nuclei, and an embryo is formed with its growing meristem confined to the lowest group of cells. A suspensor, made up of cells lying above this meristem, pushes the embryonic tip into the tissue of the megagametophyte, which is converted into the endosperm of the seed. While an enzyme secreted by the embryonic structures digests part of the megagamet-

area, ranging from Madagascar to India and China, the East Indies, Australia, and southern Japan. The female cones, unlike those of all other cycad genera, consist of a crown of leaf-like sporophylls bearing several ovules laterally near their base. New leaves, whose leaflets have a single median vein, appear at the tip of the seed cone axis, and individual sporophylls are cast off in place of the entire cone. In the other cycad genera, seed cones are usually crowded aside, and the new crown of leaves arises from formative tissue (meristem) developing laterally to the base of the old cone. This condition applies to pollen cones of all species.

Sometimes this genus is regarded as the sole member of the family Cycadaceae, while all other genera are regarded as members of the family Zamiaceae. *Cycas circinalis*, known as the fern palm, has been called the gem of the genus. It is widely distributed and cultivated. *C. revoluta*, the so-called sago palm, is the hardiest species and the most popular for cultivation. Its dark green leaves and red seeds are very conspicuous. The leaves are the most widely used material for funeral wreaths and are used in place of palms on Palm Sundays. Its name sago palm is misleading, since the starchlike substance taken from the large pith of the trunk is neither true sago nor is the plant a palm.

(2) *Macrozamia* is an Australian genus with 16 species. Some are columnar, including the tallest cycads known (*M. hopei* may reach 60 feet), while others are tuberous. The leaflets are parallel-veined, lack a midrib, and in some species have a gland at the base. The sporophylls are usually terminated by long flat spines. When mature, the seed cones of *M. denisonii*, regarded by some as the most beautiful cycad, may become three feet long and weigh as much as 85 pounds. Some species, like *M. spiralis*, look more like palms than other cycads. *M. moorei*, whose cones occupy a position identical with that of the cones of the Cycadeoidales of the Mesozoic era, is very abundant locally in Queensland. Since the leaves contain a poison disastrous to cattle, plants of this species are being eradicated.

(3) *Bowenia*, with two low-growing, tuberous species (*B. spectabilis* and *B. serrulata*), is the

third genus found in Queensland, Australia. Their doubly pinnate leaves distinguish them from all other cycads.

(4) *Encephalartos*, bread palm, with 20 mostly columnar and some tuberous species, is an entirely African genus. Thirteen of these species are found in South Africa, others extend to Natal and Zululand as well as the Gold Coast. The leaflets are parallel-veined, lack a midrib, are either entire or spinose-toothed, and are often pungent-pointed. Sometimes the lower leaflets are gradually reduced to prickles. Cones weighing about 100 pounds and measuring three feet in length, the largest known, are found on *E. caffer*. The cones of other species are usually smaller but more numerous. *E. altensteinii* is the most familiar cultivated species.

(5) *Stangeria* is a monotypic endemic genus found in the coastal belt of South Africa between

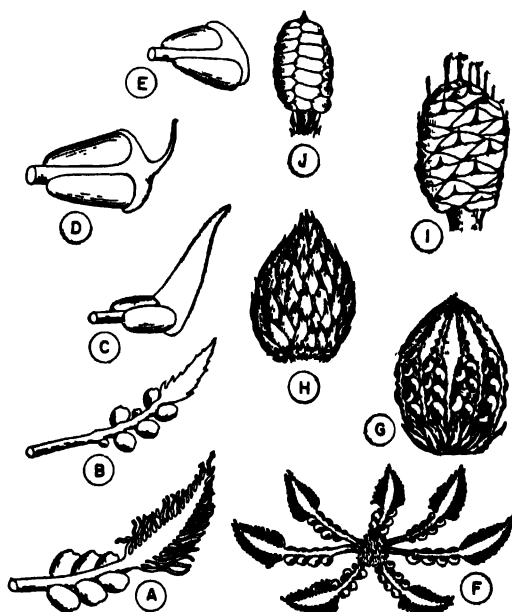


Fig. 11. Megasporeophylls and cones of living cycads. (A) leaf-like megasporeophyll of *Cycas revoluta*; see (F) for open arrangement of these; (B) reduced leaflet of megasporeophyll of *Cycas media* whose megasporeophylls are forming a cone during early stages; see (G); (C) megasporeophyll without leaflet in *Dioon edule*; see cone in (H); (D) leaf character of megasporeophyll almost lost, but midrib remaining as a spine, *Macrozamia miquelii*; see (I) for true cone; (E) midrib also lost, *Zamia floridana*; see (J) for compact cone.

Port Alfred and southern Zululand. *S. paradoxa* has a subterranean, simple or branched stem, fernlike leaflets with a prominent midrib and spreading, forked lateral veins. The densely tomentose cones have imbricate scales.

Western Genera.—(1) *Dioon* (the original spelling *Dion*, although still in use, is incorrect), with six columnar species, occurs in central Mexico. A new species has been found in cultivation in Honduras. The leaflets lack a midrib, are parallel-veined and broadly inserted on the rachis. The cones are terminal and their scales are very broad. *D. spinulosum* may reach 50 feet in height and is thus the second tallest member of the family. It has spiny leaflets and bears large female cones, 20 inches long and 30 pounds or more in weight. It may form *Dioon* forests of limited extent. The Mexicans make a kind of

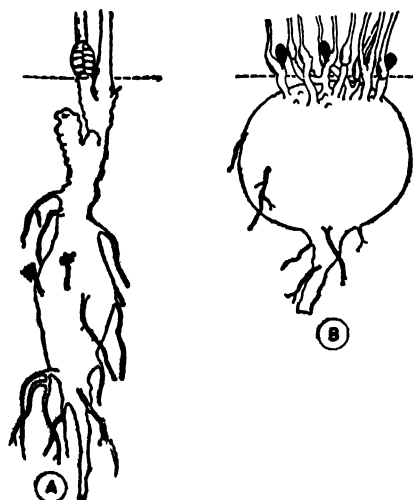


Fig. 10. The narrow, spindle-shaped stem of *Bowenia spectabilis* (A) differs markedly from the short, broad stem with numerous branches on top of *Bowenia serrulata* (B). Note male cones on some branches.

tortilla from a meal obtained from the seeds of *D. spinulosum* and *D. edule*.

(2) *Ceratosamia*, including six short, columnar species, also occurs in Mexico and Central America. The large leaves have pointed leaflets that are narrowed at their base. The terminal cones are large and their sporophylls bear at their tips two firm, laterally divergent spines (hence the generic name). *C. mexicana* is the dominant species.

(3) *Microcycas*, Palma Corcha, is a monotypic genus found in Pinar del Río, western Cuba. Its only species, *M. calocoma*, is columnar in habit, but occasionally branched, and sometimes 30 feet high. The leaflets are parallel-veined. The large cones bear sporophylls with a rounded pyramidal extension at the apex. Outstanding characteristics of this genus are the numerous sperms in the pollen tube, an unusually large number of archegonia, siphonostele in the axis of the seedling, and its thick bark. It rarely develops cones in its native habitat, and it has never been successfully cultivated.

(4) *Zamia* is the largest genus of living cycads, with 30 tuberous or branched species whose distribution ranges from southern Florida to Brazil, Peru, and Chile. The leaflets are

first generation were ready to produce cones. Of these 50 plants, 47 had 2 cotyledons as in *Zamia*, whereas 3 had 1 cotyledon as in *Ceratosamia*. Thus *Zamia* appears to be dominant in regard to the number of cotyledons. The leaves, however, were like those of *Ceratosamia*. The leaflets in turn resembled both parents in certain respects; the stomata showed characteristics of both parents. The cones could never be checked.

It is noteworthy in this connection that *Zamia* and *Ceratosamia* are similar in chromosome number and morphology, both having a haploid count of 8. Other haploid chromosome numbers are: *Cycas*, 11; *Bowenia*, 9; *Macrozamia*, 9; *Stangeria*, 8; *Encephalartos*, 8; *Dioon*, 9; and *Microcycas*, 13. Although the genomes of the species within each genus are apparently quite similar, the genera differ considerably in chromosome number and morphology. The most characteristic basic haploid numbers are 8 and 9.

Uses.—Cycads are used in various ways, but are not economically important. They can readily be grown outdoors in tropical and subtropical countries, but must be cultivated in greenhouses in temperate regions. The dark leathery leaves, especially of *Cycas revoluta*, are widely used as palm leaves for decoration in churches and for

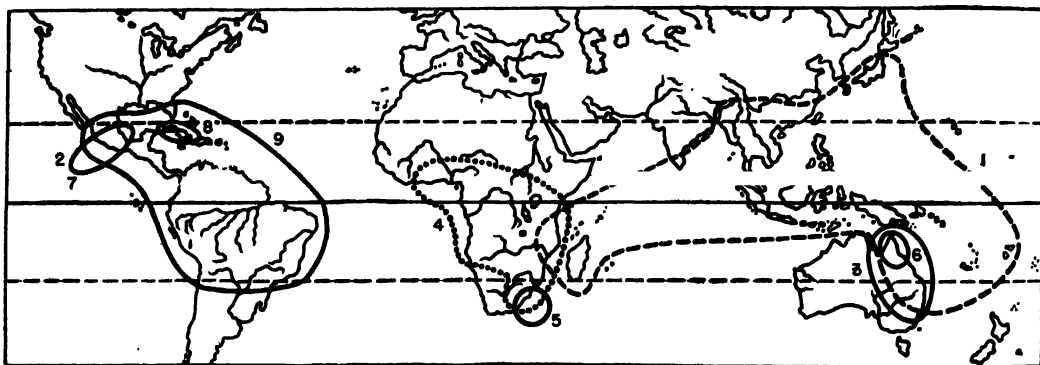


Fig. 12. Distribution of the genera of living cycads: 1, *Cycas*; 2, *Dioon*; 3, *Macrozamia*; 4, *Encephalartos*; 5, *Stangeria*; 6, *Bowenia*; 7, *Ceratosamia*; 8, *Microcycas*; 9, *Zamia*.

parallel-veined. *Z. pygmaea*, the smallest known cycad, grows near *Microcycas* and has leaves a few inches long and stems one inch long and about half an inch in diameter. Other species are larger and often bear more than one pollen cone. The sporophylls are shield-shaped and usually arranged in a dense spiral simulating vertical rows. The Florida species have been used by the Indians for making soap. They are grown for ornamental purposes. It has been suggested that the Florida species were introduced by man from the West Indies in pre-Columbian times, but paleobotanical, botanical, and anthropological data refute this possibility.

Hybrids.—Putative hybrids have been reported in *Ceratosamia*, but several species can probably be raised from the seeds of a single cone of *C. mexicana*. More than a dozen successful pollinations have been carried out. In a cross of *Zamia latifoliolata* with *Z. pumila*, the first male cone of the offspring appeared in six years, and the following year the first female cone was produced. The second generation of these crosses was still growing in 1934, but remained unchecked. A cross of *Ceratosamia mexicana* with *Zamia monticola* yielded more than 100 seeds, and 10 years later 50 plants of the

funeral wreaths. In Asia the seeds of some species of *Cycas* (as *C. circinalis*) are used as food by native races, particularly so in India in times of food shortage. While fresh, seeds of cycads are harmful or poisonous and must be soaked in water for a long time after pounding or cooked before being eaten. The seeds are rich in starch, and a kind of flour is sometimes prepared from them. Queensland nut is the name of the edible seed of some species of *Macrozamia*, and the seeds of other species are known by various common names in Australia. Bread is made from the seeds of *Encephalartos caffer*, the African bread palm. The underground stems of the Florida species of *Zamia* are known as coontie, and are used as a source of food (arrowroot) by American Indian peoples.

FOSSIL CYCADALES

Cycads and fossil cycads are often put in the same group, called Cycadophyta, but despite many vegetative similarities between them, their reproductive organs and epidermal (cuticular) characteristics differ so profoundly that they are best treated as separate and equivalent categories.

The vast majority of the plant remains commonly called "fossil cycads" either belong to

other groups, mostly to the cycadlike Cycadeoidales (Bennettitales), or lack the structural detail to permit unequivocal identification. The successful application of a new technique applicable only if the fossil material, particularly the cuticle, is in a carbonized state of preservation, has resulted in the allocation of many misidentified and doubtful specimens to other groups and a great reduction in the number of fossils actually referable to the cycads, but it has placed them on a

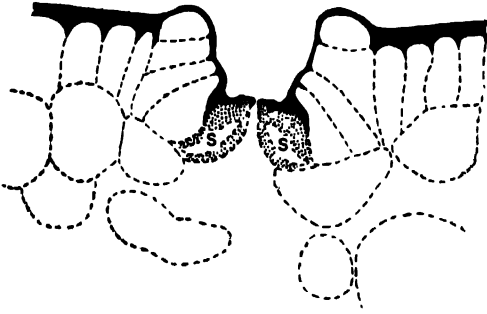


Fig. 13. Median longitudinal section of stomatal apparatus of *Dioon spinulosum*. S, guard cells. Black, heavy cutinized layer; stippled, woody parts of walls of guard cells; broken lines, cell walls; x 500.

sound scientific basis. This technique, often called cuticular analysis, was first applied to fossil material, then widely used in comparative studies of the epidermis and cuticle of living gymnosperms of all groups. Finally, the refined procedure and the extensive results obtained were used anew on fossil material. Consequently, two main types of stomatal apparatus are now recognized in gymnosperms:

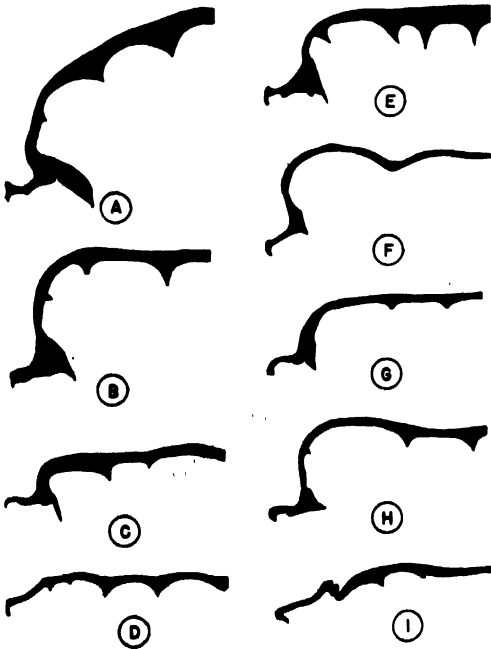


Fig. 14. Median longitudinal sections of stomates of leaves of living cycads. Only one half of each stomate shown and all parts other than cutinized layer removed for easy comparison with fossil material. (A) *Macrozamia densonii*; (B) *Ceratozamia mexicana*; (C) *Microcycas calocoma*; (D) *Bowenia spectabilis*; (E) *Encephalartos villosus*; (F) *Cycas micholitzii*; (G) *Cycas circinnalis*; (H) *Zamia media*; (I) *Stangeria paradoxa*.

(1) The simple or haplocheilic type (with simple lip), present in most gymnosperms (seed ferns, cycads, ginkgos, Cordaitales, conifers, and Ephedra). The original mother cell divides once longitudinally forming the guard cells; lateral cells are epidermal cells equivalent to the mother cell.

(2) The advanced or syndetocheilic (or simply syncheilic) type (with compound lip), found in the Cycadeoidales, Welwitschia, and Gnetum. Normally the mother cell divides twice, the median cell functioning as the mother cell of the guard cells and dividing longitudinally. The lateral (mesogene) cells are thus direct descendants of the original mother cell, and function either directly as subsidiary cells, or the latter are cut off from them by longitudinal walls.

The various configurations of the cells of the stomatal apparatus and those surrounding it furnish excellent taxonomic characters by which many fossils formerly of doubtful status have now been definitely assigned to their proper groups. The profound differences in cuticular characters exhibited by fossil cycads and cycadeoids definitely preclude placing these groups together in a higher category.

Development.—Although certain fossils, such as several Paleozoic (Permian) woods (*Cycadoxylon* and *Ptychoxylon*) and leaf types (*Dioonites*, *Pterophyllum*, and others), suggest the presence of true cycads during late Paleozoic times, the earliest authentic records of cycads date from the Triassic. Outnumbered by their contemporaries, the cycadeoids, the cycads reached their maximum development and distribution during Mesozoic times, and left a less impressive record during the Tertiary.

According to the paleobotanical record the two main lines of the cycads (Cycadoideae and Zamioideae) are about equally old. So far no authentic fossil trunks have been found. Authentic foliage referable to cycads is now known from Mesozoic (Triassic-Cretaceous) strata and Tertiary (Oligocene) deposits. As the known Mesozoic Cycadales are typically cycadaceous in structure, we may postulate that they arose during late Paleozoic times from some pteridospermous ancestors with tainiopterid leaves. Although the Cycadales never became as prominent as their contemporaries, the Cycadeoidales, the cycads survived in widely separated and greatly reduced areas, whereas the "fossil cycads" became extinct. Some living members indicate the great age of the group, while others seem to be actively engaged in speciation. This curious circumstance makes them particularly interesting objects for the study of evolution.

Fossil Genera.—The following list includes only those fossils that may plausibly be regarded as members of the Cycadales.

Mesozoic Fossils.—(1) The genus *Dioonitocarpidium* is of Triassic age and is known by three species, *D. pennaeforme* from western Germany, and *D. keuperianum* and *D. lilienstermi* from Austria. The fossils represent fertile leaves (megasporophylls) of the *Cycas* type, up



Fig. 15. Reconstruction of the megasporophyll of *Dioonitocarpidium keuperianum*; x $\frac{1}{4}$.

to eight inches long, bearing two or more seeds on each side near the base.

(2) The genus *Bjuria*, from the Rhaetic stage in Sweden, is based on large, bananalike leaves (*B. simplex*), forming a crown on a straight trunk about 10 feet tall, and fertile leaves (megasporophylls) described as *Palaeocycas integer* spirally arranged in an apical cluster. The reconstructed plant resembles species of *Cycas*.

(3) The genus *Androstrobus* includes two species (*A. manis* and *A. wonnacotti*) of male fructifications of Jurassic age from the Yorkshire coast of England, agreeing in all essentials with male cones of living cycads. Though smaller and lighter than most cycad cones, the fairly large microsporophylls resemble most closely those of *Encephalartos*.

(4) The genus *Beania* includes several species of Jurassic female fructifications. *B. gracilis* has a cone about four inches long, with the sporophylls arranged in a very loose spike. The sporophylls are broadly oval (peltate), bearing two seeds near the lower margin. The internal structure of the seeds is identical with that of living forms.

A. manis and *B. gracilis* are conspecific as indicated by their epidermal structures. Both cone genera are frequently associated with leaves of the *Nilssonia* type and are believed to belong to the same plants. Both genera are clearly cycadaceous and are referable to the *Zamia* alliance.

(5) The monotypic genus *Almargemia* from the Cretaceous in Portugal includes sterile pinnate leaves four inches long and two and a half inches wide. It probably belongs to the Zamioideae.

(6) Leaf genera referable to Cycadales are the pinnate types *Nilssonia*, associated with *Androstrobus* and *Beania* cones (Jurassic), *Ctenis*, *Pseudoctenis* (including *Pseudopterophyllum*), *Doratomyllum*, and the giant, long obovate, entire *Macrotaeniopteris*.

Tertiary Fossils.—Fossils of Tertiary age include the following (many other Tertiary fossil remains from the Old and New Worlds have been described as cycads and frequently placed in living genera, but because they lack structure they are omitted from this list):

(1) Up to 1954, *Macrozamia hopeites*, based on leaf fragments from Oligocene brown coal found at Bacchus Marsh, Victoria, Australia, was the only Tertiary cycad whose epidermal structure had been studied like that of the Mesozoic cycads. *M. hopeites* closely resembles *M. hopei*, the tallest living cycad and the northernmost representative of the genus, which is confined to a small area of northeastern Queensland, near Cairns, between latitudes 16° and 18° S. Bacchus Marsh, where *M. hopeites* was found, is about 38° S. *M. denisonii*, whose epidermal characters differ from those of all other members of the genus except *M. hopei*, occurs in an area halfway between the areas occupied respectively by *M. hopeites* and *M. hopei*.

(2) Two genera based on pollen, *Cycadopites* and *Dioonipites*, have been described from the Eocene Green River formation in the western United States. *Cycadopites* resembles grains of living species of *Cycas*. *Cycadopites follicularis* from coal of the Fort Union series (Paleocene) has been referred here. *Cycadopites* has a furrow along the full length of the grain, which is open

at the ends but closed in the middle, with the edges overlapping. *Dioonipites* cannot be definitely regarded as cycadaceous, although the grains resemble those of *Dioon spinulosum*.

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THEODOR JUST,
Chief Curator, Department of Botany, Chicago
Natural History Museum.

CYCADOPHYTA, sîk-à-döf'i-tà, comprise all living and fossil (mostly Mesozoic) cycads (Cycadales, Cycadeoidales). Although introduced by Alfred Gabriel Nathorst in 1902 as a collective term for all plants, living and extinct, with cycad-like leaves, this designation is now often used for the entire predominantly large-leaved (megaphyllous) branch of the gymnosperms, including seed ferns (*Pteridospermae*, *Caytoniales* and related groups), cycads (Cycadales), and cycadeoids (Cycadeoidales). The other mainly small-leaved (microphyllous) branch is known as the *Coniferophyta*, composed of conifers, ginkgos, *Gnetales*, and fossil groups such as the *Pityae* and *Cordaiales*. Such differences of circumscription quickly render this otherwise useful term obsolete for taxonomic purposes. In addition, extensive paleobotanical studies on the structural characteristics of the frequently carbonized cuticles of fossil gymnosperms and of those of their living counterparts have demonstrated wide divergences among them. Despite conspicuous similarities in vegetative habit of living and "fossil cycads," profound differences are present in the reproductive organs and cuticular as well as epidermal characteristics. Thus many sterile cycadophyte leaves, nearly all of Mesozoic age, can now be definitely assigned on the basis of cuticular analysis either to the cycads proper or to the "fossil cycads" (cycadeoids). The term *Cycadopsida* (Lam 1948) could be substituted for *Cycadophyta* as originally defined. However, it is becoming increasingly clear that the cycads and "fossil cycads" can be retained in the same group only because of tradition and not because of close relationship. They are now best treated as two entirely separate groups of equal rank, followed by a supplementary group for material not as yet referable to either of these two or some other groups. See also CYCADALES; PALÉBOTANY.

THEODOR JUST,
Chief Curator, Department of Botany, Chicago
Natural History Museum.

CYCADS. See CYCADALES.

CYCLADES, sīk'la-dēz (Gr. KYKLADES, kyē-klā'thās), the ancient and likewise the modern name given to the principal group of islands in the Grecian Archipelago, now belonging to the Republic of Greece and formed into a separate province. The largest islands of the group are Andros, Paros, Tenos, Naxos, Melos, Kea, Los, Amorgos, and Thera. They are situated between lat. 36° and 38° N. and long. 24° and 26° 30' E. They are generally mountainous and evidently of volcanic formation. Mineral resources are of considerable importance. They produce southern fruits and large quantities of marble, limestone, slate, gneiss, marble and eruptive rocks. Wine, brandy, hides and tobacco are exported. Hermoupolis on Syros Island is the principal trade center and capital. Pop. about 129,015.

CYCLAMEN, sīk'la-mēn, a genus of perennial herbs of the natural order Primulaceae. There are about a dozen species, mostly natives of the Caucasus and the Mediterranean region, and characterized by flattish turniplike tubers or corms, long-stemmed, more or less rounded or heart-shaped leaves and solitary, single flowers with reflexed petals of great range of color. The best-known species grown in America is *C. latifolium*, popularly known as *C. persicum*. It has produced a very large number of horticultural varieties, including some double forms, and is probably the most satisfactory window gardening plant, because of the profusion of its blossoms during many months and also because of the simplicity of its culture. The seeds are sown in early winter and kept steadily growing until the following winter, when they should commence to blossom; that is, in from 12 to 15 months. The roots must not be allowed to dry up like other bulb roots. The plants do not stand the heat of American summers and are therefore less popular as garden flowers than in Europe.

CYCLE, a term used for every uniformly returning succession of the same events. On such successions or cycles of years rests all chronology, particularly the calendar. A period of 28 years is called a solar cycle and serves to show the day of the week falling on the first day of January in every year. The lunar cycle is a period of 19 years, after which the new moon falls again on the same day of the month. Besides these two cycles, which are indispensable for the calculations of the calendar, there are some others, several of them known by the names of periods.

CYCLING, a sport that has twice risen to a peak in popularity: first with the invention of the draisine in 1816, and again in the 1890's with the development of the pneumatic tired safety bicycle for both men and women. Since the late 1890's, cycling has also been a major organized sport, with carefully kept championship records and precise international rules. In the mid-20th century cycling remains, as well, one of the commonest forms of mechanical transport. Assuming that the more than 129,000,000 bicycles in use the world over (1952) travel an average distance of 15 miles per day, cycling accounts for half as much mileage as motoring and thirty times the world's railroad passenger mileage.

History.—In ancient Egyptian and Babylonian sculptures, Pompeian frescoes, and at least one

known English medieval stained glass window, riders are represented mounted on bicycle-like vehicles. However, only after the invention of the draisine or hobbyhorse about 1816 did cycling become generally popular. This device, crudely resembling a modern bicycle, invented by Baron Karl von Drais (whence its name), consisted of a front and a rear wheel, with a saddle mounted between. The front wheel was pivoted for steering and the machine was propelled by the rider thrusting his feet against the ground. The draisine was taken up with such enthusiasm by the young bloods of the smart set in France, England and America, that it soon earned the name of "dandy-horse." During later development and improvement other names included velocipede, boneshaker, ordinary, high-wheel and, finally, "the safety," the bicycle as it is known at the present time.

The individual cyclist, using his machine as a means of transportation, can be found in all parts of the world, more numerous in proportion to the scarcity of automobiles. As a source of recreation, cycling shares with walking an intimacy of contact with the land traversed and with the people in it, but the cyclist has the advantage of a much greater range of movement. Other outdoor exercises, although providing similar mental stimulus or relaxation are not properly comparable, as they rarely serve a strictly utilitarian purpose as well.

Racing.—Cycling reaches its highest form of perfection, both in the physical development of the performer, and the quality of equipment used, in bicycle racing. Millions of spectators in European, South American, and Asian countries are attracted to bicycle racing events each year. Parimutuel betting on the professional races at tracks in Japan and Denmark provides additional interest in those countries.

The organization of the sport of bicycle racing is under the jurisdiction of the Union Cycliste Internationale (U.C.I.), one of the most efficient sports governing bodies in the world, with headquarters in Paris. This Union was formed in 1900 with Belgium, France, Italy, Switzerland, and the United States as charter members. Its principal purpose was the formation of rules for international competition, recognition of world records and the enforcement of suspensions, preventing riders from competing in other countries if barred in their own. The U.C.I. is unique among sports bodies in that it controls both amateur and professional competitors.

The Amateur Bicycle League of America (organized 1921), a member of the U.C.I., the Amateur Athletic Union and the United States Olympic Association, governs the bicycle racing sport in the United States.

The international organization supervises the world championships which are held annually, under award to various member countries. These championship events are usually staged in one of the European countries where the sport is most popular—France, Italy, Holland, Switzerland, Denmark, Belgium, and Germany. England has not been host to such a tournament since the events at Liverpool in 1922 and previous to that at London in 1904. World championships for cycling were last held in the United States in 1912 at Newark, N. J. The first such competition in the United States was held at Chicago. Canada (Montreal) furnished the venue for the events in 1899. The concentration of these annual events

in Europe of recent years is indicative of bicycle racing's great popularity on that continent.

All nationalities are represented in the records of World Sprint Champions in both the amateur and professional classes. W. J. "Bill" Bailey of England stands out as one of the most consistent in the amateur class, having garnered that title in 1909, 1910, 1911 and again in 1913. Arthur Zimmerman of the United States was the first winner in 1893 and other Americans appear among the prize winners on several occasions during the early years of this competition.

Performances of professionals have been more consistent with the great Danish cyclist, Th. Ellegard, World's Professional Sprint Champion in 1901, 1902, 1903, 1906, 1908, and 1911. Other consistent winners have been: Pete Moeskops of the Netherlands, 1921 to 1924 inclusive, and again in 1926; Lucien Michard of France, 1927 to 1930, and Joseph Scherens of Belgium 1932 to 1937, and again 1947. Reg Harris of England added his name to the list, attaining these top honors in 1949, 1950 and 1951.

World Championship competition is also contested in other branches of the sport—such as long distance road racing, unpaced (trials against time) and motor-paced events, but the short sprint races are held in highest regard, such as the Heavyweight Champion in boxing being remembered, while the other class weights are more quickly forgotten.

However, professional racing on the road, which means covering long distances over the highways, usually from one important town to another, reaches its climax each year in the annual "Tour de France." Here man and machine are put to the most severe tests with the racers pedaling over four to seven thousand foot mountain peaks as they speed across the borders of Belgium, Spain, Switzerland, and Italy in winding the three thousand and some odd mile course around France, usually starting and finishing in Paris. The summer heat of southern France and the cold of the mountain peaks makes this, in addition to the world's greatest bicycle race, the most gruelling and at the same time the biggest, noisiest and most fascinating of sports events.

All France is transformed into a nation of bike-racing experts each summer when the "Tour" charts its way through some 800 communities and each of these assumes the air of a national holiday the day that the bicycle riders and their caravan of busses, trucks with equipment, automobiles with officials and motorcycles with newspaper sports writers go through. The grind is run in approximately 25 stages that cover from a minimum of 85 miles one day to a maximum of 200 another and with several single days of rest consumes in all close to a month's time. The winner of the first stage wears a yellow jersey, which is transferred to each new leader as the race progresses from day to day. Eyes are strained by thousands along the roadway for the man in the yellow jersey, which usually changes hands many times. But the man who wears it for the one final lap—the lap of honor at the finish in the Parc des Prince track with 40,000 in attendance is a rich man—for he is well rewarded, honored and praised. His name and fame are featured in thousands of advertisements.

The bicycles used in the Tour of France are the strongest and lightest available, the average weight 21 to 22 pounds, including 8 to 10 speed gears which allow tremendous speeds down grade and comparative ease for mountain climbing.

While quite a wide variety of nationalities are represented in the list of World Sprint Championship winners, the victors of the Tour of France since first run in 1903 have come from France, Belgium, Italy and Luxembourg, and only lately from Switzerland.

Some particular names are indelible with the sport of cycling, such as Frank L. Kramer of Orange, N. J. who won the American professional title 16 successive years, 1901 to 1916, and again in 1918 and 1921. Kramer also won the American amateur title the first time staged, in 1899, and accounted for the professional world's championships in 1912.

Following the Tour of France, 6-day bike racing continues popular in countries like France, Germany, Belgium, the Netherlands, and England. These events held a high place in American sports until World War II, having originated at New York's old Madison Square Garden at the turn of the century. The profits from the event there are reputed to have made the building of the present Madison Square Garden possible. These week-long grinds usually feature about a dozen two-man teams who ride continuously, each racer taking a turn while his partner rests. The winners in Madison Square Garden grinds are considered among the great cyclists of all time—with such names as (Iron Man) Reggie McNamara, Alfred Goulet, Piet Van Kampen, Walter Rutt, Oscar Egg, Maurice Brocco, Franco Georgetti, Alfred Letourner and Torchy Peden among the most famous.

Speed being paramount in competitive sports, the records made during the years will give an idea of the ground that can be covered on a bicycle. In 1912 Alfred Goulet rode a mile against time at Salt Lake City in 1 minute 51 seconds and established a record that still stands. Since the international governing body switched to the metric system, Reg Harris of Great Britain set 1.09½ seconds (Milan, 1949) as a record against time for 1,000 meters.

Fausto Coppi of Italy (a Tour of France winner) holds the record for distance covered in one hour of continuous anking 28 miles 885 yards, made at the Vigorelli Velodrome in Milan, Italy, in 1942. In road races such as the Tour of France, and others of similar nature Tour of Switzerland, Tour of Italy, etc., the average speed for distances covering from 150 to 200 miles approximates 22 miles per hour.

However, for all-out speed on a bicycle, the record ride behind a Long Island Railroad train of Charley "Mile-a-Minute" Murphy, June 30, 1899, over a specially built wood track between the rails, when he covered a mile in 57½ seconds (better than 60 miles per hour) earned him one of the best known names in cycling.

Since then many attempts have been made to break his record, the most spectacular of which, authenticated by the American Automobile Association electric timer, Alfred Letourner's 108.92 miles per hour May 17, 1941, at Bakersfield, California. For this amazing performance Letourner had a specially constructed bicycle with a gear ratio of 252 (57 inch chain wheel and 6 tooth rear sprocket) which he rode behind a shield on a racing auto piloted by the well-known racing driver Ronnie Householder. It took Letourner 3 miles to get over the 100 miles per hour speed and 4 miles to slow down after covering the measured course in 33.05 seconds.

Cycle Touring.—Mileage on a bicycle is not confined to racing men. In fact, touring cyclists—those who make a hobby of touring—think nothing of riding 75 to 100 miles day after day and particularly on week-ends. There are a surprising number of such wheelmen in the United States, many over the 50-year old age mark, and their counterpart in England and European countries are legion. In America these enthusiasts are associated with the League of American Wheelmen or the American Youth Hostels. The latter is affiliated with the international Youth Hostel movement which has branches in many European countries.

Alliance Internationale de Tourisme (A.I.T.) coordinates the activities of the touring cyclist wherever the sport is organized. Many countries are affiliated, such as the Cyclists Touring Club of Great Britain which with its 50,000 members is the largest club of its kind in the world. France (Touring Club de France) and other countries where the cyclist has wide favor also have membership in the A.I.T.

Discovering things about the world we live in is one of the greatest pleasures of life and the cyclist has tremendous advantages in this respect. He travels far with ease, and if he uses his intelligence as well as his eyes, even though he lives in the biggest city—he will become a true "countryman." Cycling has so many sides and so much to offer everybody who will take the trouble to practice it properly. It is available not only to the young and vigorous, but to many who have neither the desire nor the physique for strenuous athletics.

Consult *Cycling Almanac* (New York, annually); *American Bicyclist and Motorcyclist* (New York, monthly); *Cycling* (London, weekly); *The Bicycle* (London, weekly).

OTTO EISELE.

CYCLING IN CANADA

The Canadian Wheelmen's Association is the governing body of cycling in Canada, for both amateur and professional. This body was formed in Chatham, Ontario, in 1882, became incorporated under a Dominion charter in 1935, and is affiliated with the Union Cycliste Internationale, the parent governing cycling body of the world. The work of the association is divided into districts from coast to coast.

In recent years the Canadian Track Championships have been conducted at various places from Montreal, Que., to Vancouver, B.C. The 150-mile Open Canadian Road Championship is the only championship in which foreign riders are invited to compete.

Provincial championships may be held yearly in each province under the supervision of the district chairman.

Vancouver, B. C. has a 250-meter outdoor banked board track, while Delhi, Ontario, has a portable banked board track, which may be set up for indoor racing. A number of asphalt surface tracks are in existence for outdoor racing.

Annual road race events: at Vancouver, B.C. the Daily Province Race was inaugurated in 1920; Toronto, Ontario, has had its High Park 25-mile since May 1938; in Quebec, the 170-mile Quebec-Montreal race has been a yearly event since 1931, Douglas Peron of Montreal being the only rider to win the race three times, thus retaining the coveted LaPresse Trophy.

The team of Robert McLeod of Toronto, Ontario, and George Turner of Ottawa, Ontario, represented Canada at the 1934 British Empire Games in England. McLeod won the 10-mile and finished second in the 1,000-meter time trial, giving Canada the 1934 title.

Professional six-day races started in Toronto in 1912, none of the competitors being Canadian. At the second race, held at Montreal in 1929, the competition of Canadian entrants greatly stimulated popular interest; subsequently two races were conducted each year until 1935. Promoter Willie Spencer sponsored spring and fall races at Toronto from 1932 to 1935. Races were held at Vancouver, B.C. in 1931, 1932 and 1934. Between 1936 and 1942 races were conducted in Montreal, Ottawa and Toronto.

Canadians racing outside of Canada: William (Doc) Morton won the Amateur Cycling title at the Pan-American Exposition at Buffalo, N.Y., in 1901. Arthur Spencer won the United States National Sprint Championship title in 1917, 1920 and 1924. Willie Spencer won the same honors in 1922, 1923 and 1926; he also holds the professional quarter mile sprint record of 27½ seconds. The amateur sprint title of the United States was won by William Coles in 1926. W. J. (Torchy) Peden was on the winning team in many six-day races in the United States and Canada.

RUSSELL E. COUPLAND.

CYCLOID, the curve traced by any given point in the circumference of a circle which is rolled in its own plane upon a straight line. The rolling circle is called the generating circle and the chosen point the tracing point. The straight

line is called the base of the cycloid, and the two points on the base where the curve begins and ends are the cusps. The cycloid is commonly illustrated by reference to a wagonwheel moving along a perfectly smooth road. Each

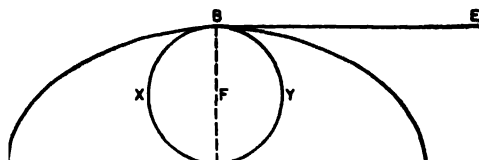


Fig. 1.—ABC, the cycloid traced by the point B of the circle DXBY as it is rolled along the base ADC. The points A and C are the cusps of the cycloid and the point B at its center, the vertex. The line BE is the tangent of the cycloid at its vertex.

point in the outer circumference of the tire of the wheel describes a cycloid during its transit from contact with the road at one point (or cusp) to the position where it is again in contact with the road. The base of the cycloid is obviously equal to the circumference of the generating circle, as it is measured off therewith. The length of the cycloid curve is four times the diameter of the generating circle. The area included between the cycloid and its base is three times the area of its generating circle. If the cycloid be inverted, so that its concave side is uppermost, a ball under the impulse of gravity alone, rolling down the curve from any point in the curve, will reach the lowest point, or vertex, in the same time that it would if started at any other point in the curve. For this reason the cycloid is called the isochronal or isochronous curve. It is also known as the curve of swiftest descent, because the rolling ball will reach the vertex in less time by following the cycloid than if it moved along any other path, even a straight line. The involute of a semicycloid, starting from the vertex, is a similar cycloid (Fig. 2). This fact coupled with the

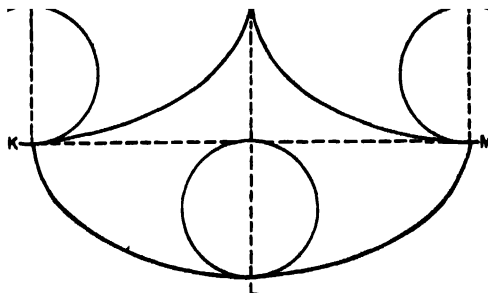


Fig. 2.—KLM, the involute of the semicycloids KH and HM traced by the point L on the supposed cord wrapped around the evolute KH. The involute is similar to the cycloids whose common cusp is at H, their generating circles being equal.

isochronal character of the curve, led the horologists to adapt the cycloid to the clock, aiming by means of a pendulum swinging always in the same time, no matter what the length of the arc, to gain a timekeeping device that would not vary. The plan failed through unavoidable friction. The curve of the cycloid is now chiefly of use in the arts in the shaping of the teeth of cog-wheels, the cycloid exhibiting less friction than any other form.

Several other curves are usually grouped with the cycloid as if related to it. Construc-

tionwise the *epicycloid*, the curve traced by a point in the circumference of a circle as it rolls around the outer side of a fixed curve, and the *hypocycloid*, which is traced by a point in the circumference of a circle rolling around the inner side of a fixed curve, are similar to the cycloid. Mathematically, however, the functions of these two curves do not bear a significant relation to the cycloid. The *prolate trochoid* and *curtate trochoid* curves are more nearly related, as they are traced by points connected with the generating circle of the cycloid as it rolls along a plane. See also TROCHOID.

CYCLOID, in zoology, a term referring to the smooth round scales of many fishes, typically the salmon and herring. Formed generally in concentric layers, cycloid scales are in contrast to ctenoid scales, which are spinous and rough.

CYCLONE, sī'klōn, a general term applied to atmospheric disturbances of varying intensities. Cyclones are characterized by a whirling air motion tending inward around a center of lowered atmospheric pressure. These disturbances are a principal mode of intermixture in the vast exchange between air masses from hot, moist tropical regions and air masses dried and cooled at higher latitudes or over continental interiors.

In its most intense form the cyclonic circulation of air attains extreme rotational speed, and its centrifugal action creates a visible funnel of low pressure; this destructive vortex is called a *tornado*. The tornado is the most violent of all atmospheric disturbances; it is a highly localized phenomenon with a restricted path of destruction rarely more than 100 yards in width. Tornadoes are most common in the United States east of the Rocky Mountains, although they are also found in other parts of the world. The early settlers of the Great Plains region of the United States called them cyclones, and constructed cyclone cellars for refuge from their violence.

Larger vortical circulations originate seasonally with some frequency over tropical ocean areas. All are called, generically, *tropical cyclones*, but they have localized names in the particular region where they occur. In the Indian Ocean such tropical storms are called cyclones; they are known as typhoons in the Western Pacific, and as hurricanes in the West Indies. These storms attain diameters of several hundred miles, and often move over great distances, usually following a curved path that tends away from the equator. When fully developed, tropical cyclones are dangerous to shipping and also to life and property on coasts over which their courses may carry them. The storm tides produced on a low coastline constitute their most dangerous feature, and many thousands of lives have been lost by drowning on such coasts.

The normal course of weather variations at middle latitudes is characterized by a succession of air masses organized mainly in curved circulations. These are attended by alternations in air pressure disclosed by readings of the barometer. Areas of low barometric pressure are more or less circular in pattern, with the air flowing roughly around and inward towards the low pressure center. These formations are termed *extratropical cyclones*; they are usually associated with the frontal zone between two large air masses of differing dynamic potential, one cold and dry, the other relatively warm and moist.

At maximum extent, such disturbances may exceed 1,000 miles in diameter and may develop widespread storminess, especially over the oceans. A fairly regular pattern of clouds, precipitation areas, and changes in air motion attends these cyclonic formations, and travels with the extratropical cyclones as they are displaced, usually eastward, by the broad operation of hemispheric air circulations. Attendant high winds and flooding rains can cause great damage over land areas, and intense wave action and destructive tides may be produced on coasts. In winter extratropical cyclones precede cold waves and are at times accompanied by blizzards. They are usually much milder in the warmer part of the year. See also ANTICYCLONE; METEOROLOGY.

W. F. McDONALD,
United States Weather Bureau

CYCLONITE, sī'klō-nīt, a powerful explosive developed after World War I for use in bombs and shells. Also known as hexogen, its chemical name is cyclotrimethylene trinitramine. Cyclonite is prepared by the nitration of hexamethylene tetramine, and takes the form of a white crystalline solid. Though more powerful than TNT, it is more difficult to use, and usually it is mixed with TNT in a compound called RDX. See EXPLOSIVES.

CYCLOPEAN WORKS, ancient masonry constructed with large blocks of unhewn and uncemented stone, said to be the work of a fabulous race of giants, the Cyclopes (q.v.). Some of these works were the massive walls of Argos, Tiryns, and Mycenae. Similar walls are to be found in various parts of Greece, Italy, and Sicily, at Persepolis and elsewhere in Asia, and at Cuzco, Peru. The earliest form consisted of huge piles of rock irregularly hewn, with the spaces filled up with smaller stones. Later the stones were cut to fit one another, and polygonal masonry developed.

Consult Müller, Kurt, *Tiryns: Die Architektur der Burg und des Palastes*, 2 vols. (Augsburg, 1930); Wace, A. J. B., *Mycenae: An Archaeological History and Guide* (Princeton 1949).

CYCLOPES, sī-klō'pēz, one-eyed giants in classical mythology. Four traditions exist concerning these creatures, whose single, circular eye was centered in the forehead. Homer describes them in the *Odyssey* as lawless, savage, polygamous, and occasionally cannibalistic shepherds who dwelt in caves in a distant land (identified as Sicily in later legends). The most notorious Cyclops was Polyphemus, whom Odysseus blinded.

Hesiod calls them the three sons of Uranus and Gaea (heaven and earth): Arges (brightener), Brontes (thunderer), and Steropes (lightener). Other authors connect them with Zeus, who released the Cyclopes from Tartarus (hell) and for whom they made thunderbolts for his war with the Titans. Eventually they were slain by Apollo, whose son Aesculapius had been killed by Zeus with Cyclopean bolts.

Virgil represents them as assistants to Hephæstus, living in volcanoes such as Etna and manufacturing armor and metal ornaments for gods and heroes. Other and later writers ascribe the Cyclopean works (q.v.) to a nomadic tribe of Cyclopes who built massive walls of stone in Greece and Italy. They were originally from Thrace, and were named after their chief.

CYCLOPLEGICS, *sī-klō-plē'jiks*, drugs which paralyze the ciliary muscle of the eye. Probably their main use is to paralyze accommodation while refracting the eyes for correction of errors of vision. They are also used to dilate the pupil in treating eye injuries, to prevent adhesions in iritis, and as a preparative in certain operations on the eye. *Atropine* and *homatropine* are the most common drugs of this type.

CYCLOPROPANE, *sī-klō-prō'pān*, a saturated hydrocarbon gas, also called trimethylene (C_3H_6). It has been used as a general inhalation anesthetic since 1934. It has a pungent, pleasant odor, and though colorless and inflammable, it is rapid in action and fairly safe if administered by a skilled technician. It is especially favored in thoracic surgery. See also ANAESTHESIA.

CYCLOPS, a satyr play by Euripides (q.v.), probably written about 423 B.C. It is the only complete drama of its type extant, but there is very little information available about its original production. In the Greek theater, each dramatist presented a series of three tragedies, followed by a satyr play, which provided variety as well as comic relief. With their frank indecencies, colloquial language, satirical manner, and disregard for plausibility, the satyr plays resembled the later Aristophanic comedies, though they retained the structure of the tragedies. *Cyclops* is a burlesque of the story of Odysseus and Polyphemus, with the central figure, the Cyclops, made completely ridiculous. The play is quite short, and its high point is the efforts of Silenus in getting Polyphemus roaring drunk. A chorus of satyrs sets the tone of festive revelling, appropriate to the Dionysian rites.

CYCLOPS, very small crustaceans, belonging to the order Copepoda (q.v.). They are common in fresh waters, especially those rich in decay. The jointed body, ordinarily not more than 2 millimeters in length, bears at its front end a single, usually red, median eye (whence the name "cyclops") and a pair of long feelers whose strokes enable the creature to swim forward in a jerky fashion. There are 5 pairs of bristly legs that also participate in swimming, and a slender abdomen terminating in bristly projections. The cyclops' food consists of minute organisms and decaying plant and animal matter.

The sexes are separate and easily distinguishable, with the males smaller than the females. Breeding is seasonal but may occur throughout the year. Females carry their eggs in a pair of sacs fastened at the base of the abdomen. These hatch in a few days into a nauplius type of larva, which gradually emerges into the adult state through a series of 10 stages, each preceded by a molt. Reproduction is prolific, a new pair of eggs being formed as soon as the old ones hatch. The cyclops is an important element in freshwater life, serving as food for a variety of small animals, especially fish. See also CRUSTACEA.

CYCLOSTOMATA, *sī-klō-stō'mā-tā* (Gr. *kyklos*, circle + *stoma*, mouth), a class of aquatic vertebrates comprising the lampreys (Petromyzontia) and the hagfishes (Myxinoidea). Cyclostomes are eel-like in general form, and were long considered a subclass of true fishes, though they are aberrant in many features, notably the absence of jaws and the presence of a sucking

mouth. They are clearly the most primitive of living craniate vertebrates.

No fossil cyclostomes are known, their nearest known relatives being certain groups of ostracoderms of the Paleozoic era. Ostracoderms and cyclostomes are now commonly placed as two subclasses of the class Agnatha. Cyclostomata are sometimes called Marsipobranchii (Gr. *mar-sipos*, pouch + *branchion*, gill) from the fact that their gills are spherical pouches with vascular lining, quite different from the hemibranch gills of true fishes. The skin of cyclostomes is smooth and richly supplied with mucous glands, especially in the hagfishes or slime eels, as they are often called. Median fins are present, but paired fins are entirely lacking. There is a single median nostril in close association with the pituitary sac or hypophysis, but though the nostril is single, the olfactory lobes and nerves are paired as in all craniate vertebrates. The mouth lies within a remarkable buccal funnel or oral hood; acting as a sucking organ, it contains horny "teeth" and a powerful protrusible "tongue" armed with similar teeth for rasping the flesh of fishes which form the prey of the predaceous cyclostomes. The notochord is enclosed in a tough fibrous sheath, but vertebrae are extremely rudimentary. The skeleton is entirely cartilaginous and membranous, and homologies with skeletal structures of true fishes are, in most cases, questionable.

Despite their essential likenesses, the lampreys and hagfishes present many striking differences. Lampreys inhabit both salt and fresh water, while hagfishes are exclusively marine. The lamprey has, in the adult form, a special respiratory chamber ventral to the alimentary pharynx. Each inner ear has two semicircular canals in the lamprey; in the hagfish they are united. In the hagfish, the muscle plates of the right and left sides alternate as in amphioxus (q.v.), while in the lamprey they are opposite as in vertebrates in general. The eggs of lampreys, even the marine species, are small, and are laid in freshwater streams; cleavage is total but unequal. The remarkable ammocoete larva burrows in sand or mud, living for 3 or 4 years before metamorphosis. The large hagfish eggs, on the other hand, are laid in salt water, and cleavage is partial. See also HAGFISH; LAMPREY; VERTEBRATA.

CYCLOTRON. See PARTICLE ACCELERATORS.

CYDONIA, *sī-dō'ni-ā*, a small tree or shrub (*C. oblonga*) of the rose family, native from Iran to Turkestan. The fruit, a yellow, fragrant, downy pome, is used in making preserves, and is commonly known as the quince (q.v.).

CYGNUS, *sīg'nūs* (in English, THE SWAN), one of Ptolemy's northern constellations, it probably represents the swan into which Jupiter transformed himself when wooing Leda. Lying in a rich region of the Milky Way, Cygnus contains 1 first, 1 second, and 4 third magnitude stars. The star 61 Cygni, notable in being the first to have its parallax measured, is 11 light years distant. Deneb (α Cygni) is an A-type supergiant vastly larger than the Sun, and β Cygni is a wide double star of strikingly contrasting colors. The large and beautiful Northern Cross, composed of six stars in the constellation, makes Cygnus easy to identify.

CYLINDER. A *cylindrical surface* may be defined as a ruled surface generated by a line moving parallel to a given line; a *cylinder* is the solid intercepted by a closed cylindrical surface and two parallel planes. A *circular cylinder* is formed by two parallel circular surfaces, called the superior base and the inferior base, and a convex surface terminated by them. Depending on the angle formed by the axis with the bases, cylinders may be either rectangular or oblique. A right circular cylinder is generated by the revolution of a rectangle about one of its sides.

The cubic contents of a cylinder are equal to the product of the base by the altitude. Archimedes found that the volume of a sphere inscribed in an equilateral cylinder is equal to two thirds of the cubic content of the cylinder.

The cylinder has found particularly important application in the field of engineering. See INDEX for references to engine cylinders.

CYLINDER SNAKE, any of about a dozen species of nonpoisonous snakes of the family Boidae (q.v.), belonging to the genera *Cylindrophis* and *Anomalocheilus*. The latter, with one species on the Malay Peninsula and another from Borneo and Sumatra, is one of the rarest of snakes, and very little is known of its habits. The genus *Cylindrophis* ranges from India and Indochina southward and eastward through Indonesia to the Aru Islands. These are small snakes, rarely more than two feet in length, and they have a blunt tail shaped like the head. When threatened, the cylinder snake conceals its head in coils of the body and flourishes its brightly colored and headlike tip of the tail much in the style of the head motions of a rearing cobra. This use of the tail as a decoy to protect the head occurs in a few other snakes as well.

CYLLENE, sī-lē'nē, or **KYLLENE**, kī-lē'nē, or **ZIRIA**, zīr'ī-ā, mountain, in northeast Peloponnesus, Greece, 7,789 feet high. In ancient times, it was on the border between Achaea and Arcadia, and was sacred to Hermes, who, according to legend, had been born in a cave on the mountain. A temple to Hermes stood on the summit.

CYLON, sī'lōn, Athenian aristocrat: fl. 630 B.C. He tried to become tyrant of Athens in 632 or 628 B.C. with the aid of his father-in-law, Theagenes, tyrant of Megara. After successfully seizing the Acropolis, the conspirators were besieged there. Beset by famine, they were finally forced to yield to the archon Megacles, the Alcmaeonid, who swore to spare them. The oath was violated, however, and the plotters were slain. Thereafter for a generation, Cylonians and Alcmaeonids engaged in continual factional warfare.

CYMA, sī'mā, in architecture, a wavy molding which curves first one way and then the other. When the curve is concave at top and convex at bottom it is called a cyma recta; when convex at the top and concave below, it is a cyma reversa. A member of the cornice in the classical orders, it stands just below the abacus or corona.

CYMBALS, sīm'bāls, in the modern symphony orchestra, cymbals are one of the basic percussion instruments. They consist of two

large circular brass plates of equal size, with deep saucerlike depressions in the center. The size of the disks may vary in diameter from 10 to 16 inches. Cymbals are of ancient Oriental origin, and were also used by Egyptians and Assyrians. The modern form was not introduced into Europe until the late Middle Ages, and until the 19th century they were used almost entirely for exotic effects.

There are several ways of playing the cymbals, all of which produce a sound of indeterminate pitch. The most usual ways are: (1) striking the cymbals together lightly, with a gliding movement; (2) clashing them together as fast as possible; (3) striking them with a snare drum or tympani stick; (4) suspending one cymbal and performing rolls on it with two drumsticks; (5) fastening them to the shell of the bass drum and playing both instruments at once.

Various modifications of the cymbal, such as choke cymbals and the sizzle cymbals, were invented by American Negro dance bands. The ancient cymbals, scored by Hector Berlioz and Claude Debussy, among others, are smaller, thicker plates, and have a determinate pitch.

CYMBELINE, sīm'bē-lēn, or **CUNOBELINUS**, kū-nō-bē-lī'nūs, early British king: d. about 43 B.C. As is indicated by the coins of his reign, he was the son of King Tasciovanus, who ruled in Verulamium. Not much is known about his career, but he was doubtless one of those kings who became close friends and dependents of Augustus. In later years he became involved in troubles with his son Adminius, whom he expelled from Britain. Adminius, seeking Roman help, instigated the expedition sent against Britain under Aulus Plautius. Cunobelinus died at this time, and his sons Caractacus and Togodumnus inherited his kingdom. Shakespeare's play *Cymbeline* is only vaguely based on his actual life.

CYMBELINE, a play by William Shakespeare written in 1609-1610 and first published in the folio of 1623. The text has elicited much emendation and bears evidence of interpolations by another hand. The last play in the folio, it was Shakespeare's first creation for the private indoor theater at Blackfriars. Grouped with the tragedies, it is rather a tragicomedy, serious in incident but with a happy ending designed to fit the taste of the special audience. The preposterous story must be judged not on grounds of likeness to reality but for its suitability as candlelit romance.

The complex plot of *Cymbeline* is a tissue of different strands. The pseudohistorical framework is drawn from Holinshed's *Chronicles*; the main plot of the wager and the slandered wife is from Boccaccio's *Decameron* (II, 9); the opposed marriage, the banishments, the cowardly brother, the cave refuge, the apparel for disguise, and the sleeping powder are all paralleled in an old play, *The Rare Triumphs of Love and Fortune* (1589); finally, such details as the wicked stepmother derive from folklore. Besides adding a new conclusion of his own, Shakespeare freely adapted this diverse material to provide, not verisimilitude, but a concatenation of exciting and emotional dramatic situations, given imaginative plausibility by poetry.

A play so full of incident cannot with justice be briefly summarized; the plot shifts rapidly, sometimes clumsily, from one group of characters

to another. The central figure is Imogen, daughter of Cymbeline, the British king. Hated by her stepmother and pursued by the latter's coxcomb son, she has secretly married Posthumus Leonatus, who is on that account exiled to Rome. There he is provoked by the cynical Iachimo into a wager on his wife's chastity. Balked in his attempts at seduction, Iachimo by a ruse obtains circumstantial details which convince Posthumus of Imogen's infidelity. Accordingly he orders her death, but she escapes and, disguised as a boy, takes refuge in Wales with her long-lost but as yet unknown brothers. Ultimately Iachimo confesses his duplicity; Imogen's repentant husband is restored to her; her brothers are recognized as royal heirs. Involved in the tale are the intrigues of the wicked queen and her son, the exploits of the true princes, and a war with Rome. The plot is entertaining as deliberate artifice, and the resolution in the last act is ingeniously contrived.

In such a play, story overrides character; yet, if the characters in *Cymbeline* are as a whole broadly drawn and not always consistent, in given situations they so reveal their sentiments as to be touched with life. The sympathetic Imogen is more fully presented than the others: she appears regal but affectionate, noble but not without spite and timidity, virtuous yet human.

The earliest performances of *Cymbeline* featured, of course, a boy actor in the role of Imogen. Sir Henry Herbert, recording a court performance on Jan. 1, 1633, for Charles I, says simply that it was "well liked by the King." Thereafter the play was variously adapted for 17th and 18th century audiences. David Garrick, John Philip Kemble, William Charles Macready, Edmund Kean, and Samuel Phelps, all played the role of Posthumus. But the Imogens take precedence, and one naturally thinks of the play on the stage in terms of actresses: Mrs. Siddons, Helen Faucit, Lilian Adelaide Neilson, Helena Modjeska, Ellen Terry, Julia Marlowe, and Sybil Thorndike. *Cymbeline* is seldom seen on the contemporary stage, but was revived at Stratford on Avon in 1949.

Bibliography. A new one-volume text edition by J. M. Nosworthy has been announced by the Harvard University Press for publication in November 1954. Consult also Furness, H. H., ed. *The New Variorum* (Philadelphia 1913); Tillyard, E. M. W., *Shakespeare's Last Plays* (London 1938); Granville Barker, Harley, *Prefaces to Shakespeare*, vol. 1 (Princeton 1946); Knight, G. Wilson, *The Crown of Life* (New York 1947); Parrott, Thomas Marc, *Shakespearean Comedy* (New York 1949); Pettet, E. C., *Shakespeare and the Romance Tradition* (London 1949).

ROBERT HAMILTON BALL,
Professor of English, Queens College of the City
of New York.

CYME, sī'mē, an ancient maritime city of Aeolis in Asia Minor. The most important Aeolian city, it lost its independence in the 6th century B.C. to the Persians, and later to the Athenians, Seleucids, Attalids, and Romans. An earthquake devastated the city in 17 A.D.

CYME, sim, in botany, a form of definite inflorescence in which the principal axis terminates in a flower and a number of secondary axes arise from the principal one, each of these also terminating in a flower. From these secondary axes others may arise, terminating in the same way, and so on. All the flower stalks rise to nearly the same height, thus forming a flat-topped or slightly convex-topped flower cluster.

The central flowers bloom first. See INFLORES-

CYMOPHANE. See CHRYSOBERYL.

CYMRI, kīm'ri, or **KYMRY**, a branch of the Celtic family of nations, which appears to have succeeded the Gaels in the great migration of the Celts westward. They apparently drove the Gaelic branch to the west into Ireland and the Isle of Man, and to the north into Scotland, while they themselves occupied the southern parts of Great Britain. At a later period, during the 5th and subsequent centuries, they were in turn driven out of the lowlands of Great Britain by the invasions of German tribes and were compelled to take refuge in the mountainous regions of Wales, Cornwall, and northwest England. A part of them may have crossed over into Gaul and settled in Brittany. Wales may now be regarded as the chief seat of the Cymri—a name which the Welsh still give to themselves—as it is still the chief place where the Cymric dialect of Celtic is spoken. A variation of this dialect, Cornish, was once spoken in Cornwall; Armorican, another variety, is spoken in parts of Brittany.

CYNARA, sīn'ā-rā, a small genus of the family Compositae, related to the thistles. It is native to the Mediterranean region and the Canary Islands. The two best-known species are the artichoke (*C. scolymus*) and the cardoon (*C. cardunculus*). See ARTICHOKE; CARDOON.

CYNEGEIRUS, sī-nē-jī'rūs. Athenian hero: d. Marathon, Greece, 490 B.C. When the Persians, defeated at Marathon, were escaping by sea, he seized a Persian ship by the stern to detain it, but died after the blow of an ax severed his right hand. Such is the story according to Herodotus, but later accounts have Cynegeirus then grasp the stern with his left hand, and after that too had been severed, with his teeth before dying from his wounds.

CYNEWULF, kīn'ē-wōōlf, West Saxon king: d. 785. He took a leading part in the expulsion of his kinsman Sigebert from the throne in 755, and was chosen to succeed him. His reign was marked by constant battles with the Welsh, and he was defeated by the Mercian king Offa (q.v.) at Bensington in 779. In 785, after he had ordered the banishment of Sigebert's brother Cyneheard, the latter surprised him at Merton in Surrey and killed him. Cynewulf's followers later gained their revenge upon Cyneheard.

CYNEWULF or **CYNWULF** or **KYNEWULF**, Anglo-Saxon religious poet: fl. 750. He is the only Old English vernacular poet known by name whose works are extant. His name is known from the runes in the poems attributed to him which appear in the two manuscripts, the *Exeter Codex* and the *Vercelli Codex*. These manuscripts were written, in the West Saxon dialect, by 10th century scribes. The poems certainly by Cynewulf are *Elene*, *Juliana*, *Crist*, and *Fates of the Apostles*. His name also occurs as the solution to one of the metrical riddles in the Exeter book. Other poems, such as the *Andreas*, *The Dream of the Rood*, and *The Seafarer*, have been assigned to him, but with insufficient grounds.

In the epilogue to *Elene*, there is an account

of his life, which may or may not be authentic. Cynewulf was probably a Northumbrian, and we may gather that he spent the earlier part of his life as a wandering minstrel or perhaps as the *scop* or court poet to some great lord, before devoting himself to the composition of the religious poems connected with his name. His poems display a deep religious feeling and a vivid imagination, especially in the description of scenes of the sea. But despite passages of beauty, they fall distinctly below the level of achievement of such poems as *The Phoenix* and *The Wanderer*.

Consult Kennedy, C. W., *The Poems of Cynewulf* (New York 1910).

CYNICS, sī'nīks, an unorganized sect of Greek philosophers, who followed the teachings of Antisthenes of Athens and Diogenes of Sinope (q.v.). Though most scholars accept the ancient assertion that Antisthenes founded the system, some students regard Diogenes as its author; certainly the latter has long been considered the Cynic par excellence.

The Cynics derived their name either from Cynosarges, a place where Antisthenes lectured, or directly from the Greek word for dog (*kyon*, *kynos*), which may have been applied because of their rejection of all modest conventions and adoption of many shameless practices. Cynicism's tenets evolved from the eudaimonistic doctrine of Socrates (q.v.), who professed that happiness necessarily results from virtue alone and that virtue, being the knowledge of what is good, was the sole end of life. The one-sided interpretation of this theory by Antisthenes led to Cynicism, from which the later school of Stoicism derived much of its moral philosophy. Similarly, a partial understanding of Socratic teaching by Aristippus and the Cyrenaics (q.v.) in turn provided the ethical doctrine of Epicureanism.

What Antisthenes and his adherents admired most in Socrates was his independence; pursuing his notions of right with utter indifference to others' opinions, caring neither for mundane pleasures nor for temporal possessions. But they failed to see that for Socrates independence and indifference were but means to an end, not the ends of life themselves. The Cynics' ideal of virtue was merely negative; it stressed the absence of all desires, freedom from all wants, contempt for all erudition. "Virtue is sufficient for felicity," said Antisthenes, "and for virtue nothing is needed but action; it needs neither many words nor much learning." Virtue was the one good, and vice the only evil. Everything else—property or poverty, pleasure or misery, liberty or slavery, health or illness, life or death—was indifferent. The virtuous—and therefore wise—man was to practice rigid self-control and maintain complete independence and ascetic simplicity in his life.

The Cynic philosophy, which was interpreted variously by its votaries, eventually degenerated from idealism into animalism. Its followers paraded around the Mediterranean area as insolent, iconoclastic, satirical mendicants, who delighted in defying decency and insulting intelligence. Yet to the early Cynics we owe two great ideas: first, the responsibility of the individual as a moral unit, and second, the supremacy of the power of the will.

Among the more noted (or notorious) Cynics

were Crates of Thebes (q.v.), his wife Hipparchia, and her brother Metrocles (both c.300 B.C.), Menippus (q.v.), and in the 1st and 2d centuries A.D.: Dio, Demetrius, Demonax, Oenomaus, Peregrinus Proteus, Sostratus, and Theagenes. The last Cynic of renown was the minor Roman historian Sallust in the 5th century A.D.

Consult Diogenes Laertius, *Lives and Opinions of Eminent Philosophers*, bk. 6; More, Paul Elmer, *Hellenistic Philosophies* (Princeton 1923); Dudley, D. R., *A History of Cynicism from Diogenes to the Sixth Century A.D.* (London 1937); Sayre, F., *Diogenes of Sinope: A Study of Greek Cynicism* (Baltimore 1938); id. *The Greek Cynics* (Baltimore 1948).

P. R. COLEMAN-NORTON,
Princeton University

CYNIPIDAE, sī-nīp'-ī-dē, a family of gall wasps of the order Hymenoptera. Antlike in size and appearance, they are cosmopolitan in distribution, producing many beautiful and bizarre galls, mostly on oaks but also to a lesser degree on roses and composites. The eggs are inserted by means of an ovipositor into the living plant tissues of roots, leaves, and stems. The larvae furnish the stimulus that results in the development of the gall in which they live and feed. Each species has a characteristic gall.

CYNOCEPHALUS, sī-nō-sēf'ā-lūs, a name given either to the various species of baboon (q.v.) or to the species of colugo (q.v.) or flying lemur (*Galeopithecus*).

CYNOGLOSSUM, sīn-ō-glōs'ūm (Gr. *ky-nos*, of a dog + *glossa*, tongue), a genus of biennial or perennial herbs of the family Boraginaceae. Its name derives from the shape and soft surface of the leaves. About 75 species are widely distributed, chiefly in temperate zones. *C. officinale*, the common hound's tongue, has reddish-purple salverform flowers, borne in the one-sided clusters characteristic of the borage family. A Eurasian species, it is often found as an obnoxious weed in fields throughout North America. However, it has also gained a reputation as a honey plant, flowering between the fruit bloom and the sweet clover. The clinging burrs are scattered by sheep.

Another well-known species, the wild comfrey, *C. virginianum*, is native from Connecticut to Florida and west to Missouri and Texas. The northern wild comfrey, *C. boreale*, occurs in New England and Canada, in Quebec and Ontario, as well as in southern British Columbia. *C. officinale* is most commonly found in fields and open woods; *C. virginianum* in upland woods; *C. boreale* in dry woods.

CYNOMORIUM, sīn-ō-mō'rī-ūm, a genus of parasitic seed plants with one species, *C. coccineum*, native in the Levant, southern Europe, and northern Africa. It depends for its food on the roots of other seed plants, has scales instead of green leaves, and bears its flowers on thick blood-red spadices. It was long known as *fungus melitensis* because it was so abundant on the island of Malta. During the Middle Ages it was believed, on account of its blood-red juice, to be effective as a styptic and as a remedy for all troubles connected with the blood.

CYNOSCEPHALAE, sīn-ū-sēf'ā-lē, a range of hills near Larissa in Thessaly, memorable for two battles fought there in ancient times.

The first was 364 B.C., between the Thebans and Alexander of Pherae, in which Pelopidas was slain; and the second, 197 B.C., in which Philip V of Macedon was defeated by the Roman consul, T. Quinticius Flaminius.

CYNOSURE, *sin'ô-shöör*, an old name for the constellation of the Little Bear or Ursa Minor, which contains the North Star (Polaris) in the tip of the tail. Cynosure, in a figurative sense, is hence used as equivalent to something which attracts general attention or draws all eyes toward it, as the pole star attracts the attention of the mariner. The word literally means dog's tail.

CYNOSURUS, a genus of grasses. See DOG'S-TAIL GRASS.

CYNTHIA, *sin'thī-ä*, the moon; a surname of Artemis or Diana, the moon goddess. In mythology Mount Cynthus, on the island of Delos, is said to have been the birthplace of Artemis.

CYNTHIANA, *sin-thī-än'ä*, city, Kentucky, county seat of Harrison County, on the South Fork of the Licking River and on the Louisville and Nashville Railroad, 27 miles north-northwest of Lexington. In the blue-grass region, it is a trade center for farming and stock raising. It has tobacco warehouses and redrying plants, horse and cattle markets, and manufactures children's clothing, cheese, fertilizer, and harness.

The city was founded in 1793 and incorporated in 1806. During the Civil War it was raided twice by Gen. John Hunt Morgan, first in 1862 and then in 1864. He was decisively driven from the town by Union troops the second time. Pop. (1950) 4,847.

CYNTHIUS, *sin'thī-üs*, surname of Apollo, the sun god, from Mount Cynthus, on the island of Delos, at the foot of which he had a temple, and on which he was born.

CYPERACEAE, *si-pēr-ä'së-ë*, a family of monocotyledonous grass-like plants including more than 2,000 species. These herbaceous plants generally grow in moist places on the margins of lakes and streams, with a cylindrical or triangular culm with or without joints; the leaves are sheathing. The family comprises the genera *Carex*, *Scirpus*, *Cyperus*, *Rhynchospora*, and others.

CYPERUS, *si-pēr'ūs*, a genus of perennial herbs of the family Cyperaceae (q.v.). The numerous species, which are natives of tropical and temperate climates, are characterized by having rootstocks or tubers, grass-like leaves, simple stems sparsely leafy below, perfect flowers in small compressed spikes which are arranged in compound umbels with numerous more or less attenuated bracts, the form of the inflorescence having suggested the popular names umbrella plant and umbrella palm, which are perhaps most frequently given to *C. alternifolius*. This species is a very popular window garden and greenhouse plant, native of Madagascar. It is readily propagated by means of seed or by division of the larger plants, and is easily cultivated in any good potting soil kept moist. It does best in a moist atmosphere. Many of the

species are troublesome weeds in cultivated fields; some are useful for food, their underground parts being starchy and mucilaginous; the tubers of others are used in perfumery. The chufa (*C. esculentus*) is valued in the southern states for its tubers, upon which swine thrive well. Papyrus (q.v.) is the product of *C. papyrus*.

CYPRES. See CY PRES.

CYPRESS is the popular name for members of the genus *Cupressus* of the coniferous family Cupressaceae. The name is also applied to certain species of the genus *Chamaecyparis* of the same family, and to *Taxodium* belonging to another family, the Taxodiaceae. *Cupressus* is represented by twenty or more species ranging from Asia to the Mediterranean and from southern Oregon to Costa Rica. The habit varies from trees 150 feet or more in height to small shrubs. The leaves are small, triangular, scalelike, closely appressed to the branches, and generally in opposite arrangement. The small ovulate cones are globular, consist of a few knobbed, peltate scales, and require two years to mature. The best-known species is probably the European or Italian cypress (*C. sempervirens*). It is indigenous to the Mediterranean area and is believed by some authors to be the "gopher" wood and "cypress" referred to in the Bible. This species is noted for the stately aspect of the trees which may attain a height of 120 feet, and also for its durable wood. The latter is yellowish or reddish, aromatic, hard and dense, and is used in cabinet



Cypress. Left: Typical silhouette of tree. Right: Detail of twig with leaves and cones

work and in the making of musical instruments. Among American species one of the most widely known is the Monterey cypress (*C. macrocarpa*). This species has been much used for planting in California because of fast growth and the large size and attractive aspect of mature trees. The Monterey cypress has been successfully introduced into many other warm regions, and in Kenya trees have attained a height of 120 feet in 30 years. However, studies on the growth and disease resistance of cypresses in California have revealed the Monterey cypress and allied species to be highly susceptible to cypress canker. These investigations have indicated that other species immune or highly resistant to this disease, such as the Guadalupe cypress (*C. guadalupensis*), the Tecate cypress (*C. forbesii*), and the Arizona cypresses (*C. arizonica* and *C. glabra*) should be considered as substitutes. The tallest of American species is the Mendocino cypress (*C. pygmaea*) for which a height of nearly 200 feet has been recorded. The hardiest is probably the Siskiyou cypress (*C. Bakeri*, subspecies *Matthaei*). Asiatic species include *C. torulosa* which grows to a height of 150 feet in the Himalayas, and

C. funebris widely distributed in China. The Mexican cypress (*C. lusitanica*), also known as the Portuguese cypress or Cedar of Goa, has been frequently planted in southern Europe.

The bald or deciduous cypress (*Taxodium distichum*) is one of the most valuable of American timber trees, its straight and close-grained, soft, brown wood being highly esteemed where exposure to moisture is expected and where durability but not great strength is demanded. It is very largely used in greenhouse construction. Its range is from Delaware to Missouri and southward to the Gulf States, being especially abundant in swamps, but it will thrive with a more or less noticeable change of habit in dry ground. It is a highly ornamental tree often 150 feet tall and sometimes more than 10 feet in diameter, with buttressed trunk, brown, flaky bark, erect or spreading branches bearing narrow light green leaves, purplish male cones and nearly globular ovulate cones. The spread of the branches in old specimens is often more than 80 feet. It has developed a large number of horticultural varieties and is very popular as a park tree as far north as New York, about its northern limit of hardiness. In the southern swamps the trees develop "knees" from their roots. These knees, which are sometimes 10 feet tall, are supposed to act as aerators, but their function is not definitely known. When fully developed their tops are above high-water level.

The species of *Chamaecyparis* best known as cypress are the hinoki cypress (*C. obtusa*) and Sawara cypress (*C. pisifera*), both natives of Japan, Lawson's cypress (*C. Lawsoniana*), indigenous to the coast of northern California and Oregon, and the yellow or Nootka cypress (*C. nootkatensis*) which grows from Oregon to southern Alaska. Horticultural varieties of *C. obtusa* and *C. Lawsoniana* are frequently planted in parks for their ornamental, often drooping foliage, and graceful habit of growth. These two species also produce wood which is light, easily worked and much used for the manufacture of sash, slats for venetian blinds, cabinets and woodenware.

N. W. BANNAN,

Department of Botany, University of Toronto.

CYPRESS GARDENS, a botanical garden at Winter Haven, Florida. Situated in the lake country of central Florida, some forty miles east of Tampa, it is a privately owned and managed preserve of 67 acres, on Lake Eloise, but is open to the public. The most striking natural feature of the gardens consists in the numerous giant moss-hung cypress trees rising from the lake and along its banks. There are also many species of palms and other tropical trees, including several exotic varieties. Among the chief floral plants are azaleas, camellias, and gardenias. Rustic bridges spanning lagoons join a series of flower-decked islets. Flower festivals are frequently held, and there are daily water skiing programs on the lake.

CYPRESS HILLS, a range of hills in southern Saskatchewan and Alberta, Canada, named by the French *Cyprès*, although the forest growth is actually jack pine. The total area, roughly one thousand square miles, constitutes the highest elevation between Labrador and the Rockies. At least a part of the area escaped glaciation, a fact which may explain the presence

of flora and fauna not native to the adjoining plains. The area contains three forest reserves and two provincial parks.

CYPRIAN, sîp'ri-ăn, Saint (in full THÄSIUS CAELILIUS CYPRIANUS), African bishop, martyr and one of the fathers of the church: b. about 200; d. Carthage, Sept. 14, 258. He was of patrician parentage and inherited a considerable estate. Having received the highest education he professed rhetoric with eminent success in Carthage and in his school held disputations with representatives of the schools of philosophy and with believers in the Christian religion, with the result that he applied for admission in the church. Shortly after being baptized (246) he was ordained priest and then was elected by the Christians of Carthage their bishop (248). In the persecutions of the Christians by Decius (249-251) he prudently withdrew from Carthage and lived in retirement, but on the accession of Gallus (251-253) he returned to his see.

There had been lively controversies among the churches over the question of readmission to the Christian communion of those who in times of persecution had renounced Christianity; churches in Asia Minor and others in Africa, among them the church of Carthage, had, in synods and in letters addressed by their bishops to other bishops, strongly condemned the practice of some churches, among them that of Rome, in accepting as valid the baptisms conferred by heretics. On the question of readmitting the *lapsi* to communion (Cyprian favored leniency: he would readmit the fallen on proof of sincere repentance. But he would not acknowledge the validity of baptism conferred by an heretical minister. On this point he was at variance with the tradition and practice of the Catholic Church, and in support of his view he sent to Pope Stephen I the acts of a synod of Carthage in which the invalidity of baptism conferred by heretics was declared. Pope Stephen replied that the tradition of the church was opposed to this and bade Cyprian not to innovate, but to recognize as true and valid baptism administered by heretics if given in the name of the Trinity. Firmilian, a contemporary, states that Stephen threatened Cyprian with excommunication. To the threat the bishop of Carthage replied with great heat, but in the entire controversy on rebaptism he never calls the authority of the pontiff in question, although he laments what he calls the injustice of the decision. In this controversy the final decision of the Roman Catholic Church was in favor of Stephen: that decision was rendered in the council of Arles (314) and in that of Nice (325).

Cyprian did much to relieve and strengthen his episcopate. Under him seven councils were held, the last in 256. In the reign of Valerian a new persecution of the Christians was decreed, and Cyprian being arrested and brought before the pro-consul refused to sacrifice to the gods and was banished and finally beheaded. His day in the Roman calendar is September 16, which day he shares with Pope St. Cornelius. His writings include *Unity of the Church*; *Dress of Virgins*; *Lapsed*; *the Lord's Prayer*; *the Vanity of Idols*; *Against the Jews*.

His works have been edited by Hartel, G., in 3 vols. (Vienna 1868-1871); there is an English translation in *Ante-Nicene Fathers*, vol. 5 (Buffalo 1886-1896).

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CYPRINE, sip'rín, bluish variety of vesuvi-anite, so called because the bluish tint is due to the presence of a small quantity of copper. The hue varies from pale blue to green according to the amount of copper present.

CYPRINIDAE, si-prín'y-dē, an extensive family of fresh-water, soft-finned fishes, distributed in about 1,500 species, over the whole world except South America, Madagascar, and Australasia. Most of the fresh-water fishes of the northern hemisphere belong to this family and most of them are small, especially the American minnows, daces, chubs, and shiners (qq.v.). Large examples are found in Europe and Asia, such as the carp, the Indian mahseer, and a few others described elsewhere by name.

CYPRINODONTES, si-prín-ô-dôn'tēz, an order of fishes of the subclass Neopterygii. Although the dentition of the family resembles that of the carp the jaws are protractile, and the ventral fins, if present, have five to seven rays. The maxillaries do not enter into the formation of the mouth, the dorsal and anal fins lack spines, the scales are cycloid or have erect spines. The frontals meet the supraoccipital. *Typhlichthys*, the cycless cave fish, and *Anabelps*, the fish with eyes divided into portions for vision in air and for vision in water, are important genera.

CYPRIOTE, sip'ri-ôt, a native of Cyprus (q.v.), also the culture and language of that eastern Mediterranean island. The modern language is a Greek dialect. The culture, despite the influence of trade and successive waves of conquest by powerful neighbors, has maintained its individuality through historic times. Archaeological investigations evidence that the island was already inhabited by a neolithic people in the 4th millennium B.C. It appears that in the Bronze Age the rich copper deposits were being worked by invaders from Anatolia, and as early as the 18th century B.C. Cypriot copper was being exported to the Euphrates Valley. In the 15th century B.C. Cyprus became a tributary of Thutmose III of Egypt. In the period of the expansion of the Mycenaean civilization of Crete, its influence was felt in Cyprus through the establishment there of trading stations. Indeed, the Mycenaean syllabary formed the basis of the Cypriot syllabary which remained in use until the 1st century B.C. See also CYPRUS—History.

CYPRIPEDIUM, sip-ri-pē'di-üm, a genus of plants of the family Orchidaceae. The genus has about 40 species, 10 of them occurring in North America, and known generally as lady's-slippers. In medicine the term is applied to the rhizomes and rootlets of several species of *Cypripedium*. The root contains a volatile oil and tannic and gallic acids, and is used as a mild antispasmodic for much the same purposes as valerian.

CYPRIS, si'prís, a fresh-water crustacean, typical of the subclass Ostracoda. It is sometimes called the water flea, and has an unsegmented body, seven pairs of appendages, a rudimentary

abdomen, and a bivalve shell enclosing all. The shell is dainty and elastic; the posterior antennae bear a long tuft of bristles on their second joint; the second pair of maxillae have a small gill appendage; and the posterior limbs are very irregular. The eggs are usually laid in masses on stones and waterplants. The adults are said to be able to survive desiccation, and this is true of the eggs. Some species are very abundant as fossils in fresh-water strata.

CYPRUS, si'prüs, the third largest island in the Mediterranean, a colony of Great Britain, 60 miles west of Syria, 40 miles south of Turkey. Its length is 140 miles, its width varies from 60 miles to 15 miles, and it has an area of 3,572 square miles. The total population in 1953 was 510,000, of which about 408,000 were Greek. The principal towns and their populations (estimated 1953) are Nicosia, the capital, 40,000; Limassol, 27,000; Famagusta, 20,000; Larnaca, 16,000; Paphos, 6,000; Kyrenia, 3,000.

Geographically, the island's main zones are the Kyrenia range, rising to a height of over 3,000 feet, along the northern coast; a massif in the southwest, the highest point of which is Mount Olympus (6,406 feet); and a central plain, the Mesaoria. The climate is hot and dry in the plains in summer, and damp on the coast; in the winter, the mountains are covered with snow for several weeks, while the weather in the rest of the island is mild. The mean annual temperature at Nicosia is 66.7 degrees, and the annual rainfall is 15.01 inches.

The government is at present exercised through a governor and an executive council. Government revenue in 1954 was £7,342,515; expenditure was £7,242,653. The public debt at the beginning of 1953 was £6,749,382. There were 706 elementary schools and 57 secondary schools in Cyprus in 1953, and 10 government hospitals, as well as 49 private clinics and 13 rural hospitals.

One half of the island's exports consist of agricultural products. The main crops are wheat, barley, potatoes, grapes, raisins, cotton, deciduous fruits, olives, almonds, carobs, citrus, pulse crops, sesame, cumin, onions, tobacco, cheese and wool. The live stock industry is small. In 1952, over 933,000 cubic feet of timber were extracted. There is also a mining industry, producing copper, salt, and asbestos, and some light industry producing consumer goods, which are exported in small quantities. Exports in 1953 were £15,413,938, and imports, £21,214,520.

There are 3,088 miles of roads, and air services link the island with Europe and the Middle East. Famagusta, the chief port, is served by a regular shipping service. A government broadcasting station is situated at Nicosia.

History.—Cyprus has had a varied and colorful history that, according to the extensive archaeological remains, began even before the Bronze Age. The early mining and working of copper, which was found in huge quantities on the island, sustained a large population with some evidence of art and culture. Aegeans colonized the island and, about 1500 B.C., it came under the rule of Egypt. The first evidence of settlement by the Phoenicians, who were to make the island a trading center in the Mediterranean, was in the 8th century B.C., and by the next century the island was thickly colonized by both Greeks and Phoenicians. Art and culture flourished as the excava-

tions at the ancient cities of Paphos and Citium show, and after a period of rule by the Assyrians, the island was brought under the Egyptian yoke by Amasis II in 550 B.C. Twenty-five years later it was annexed to the Persian Empire, becoming a part of Darius's fifth satrapy, although the cities continued to thrive under Graeco-Phoenician influence. It again fell under Egyptian rule and in 333 B.C. was conquered by Alexander the Great. However, on his death, it passed to Ptolemy I of Egypt. It continued under Egyptian rule until 57 B.C. when it was made a Roman province.

After the division of the Roman territories Cyprus continued subject to the Eastern Empire, experiencing now and again savage raids by the Arabs. In 1184, Isaac Comnenus, a prince of the imperial family of Constantinople, established himself as a despot; however, in 1191 the island was taken from him by Richard I of England during the Third Crusade, and was sold to the Knights Templar who in turn sold it to Guy de Lusignan, titular king of Jerusalem. There followed nearly three centuries of prosperous rule under this family until, at its demise, the Venetians acquired the island in 1489 through marriage ties. Venice ruled until 1571 when the island fell, after a prolonged siege, to the Turks under Selim II and became a part of the Ottoman Empire.

The island continued under Turkish rule until 1878, when it was ceded to Great Britain at the conclusion of negotiations consequent on the Russo-Turkish War. It was still nominally a part of the Turkish Empire until their entry into World War I on the side of the Central Powers. Great Britain annexed the island in November 1914, and the seizure was officially recognized as valid by Turkey in the Treaty of Lausanne (1923).

Cyprus was formally made a colony in 1925 and its legislative council, established at that time, was abolished in 1931 because of disturbances. During World War II the island became a British Navy stronghold and suffered several air raids. After the war it served as a detention camp for Jewish refugees caught by the British trying to enter Palestine. In 1947 the British offered the people by referendum a more liberal government which was overwhelmingly rejected in favor of union with Greece. Pop. (1946) 450,114.

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CYPSELIDAE. See SWIFTS.

CYRANO DE BERGERAC, sê-râ-nô' dē bër-zhê-râk', Savinien de, French soldier and poet: b. Paris, March 6, 1619; d. there, September 1655. After studying in the Collège de Beauvais, he entered the corps of guards at the age of 20, serving with them through several battles until a severe wound in 1640 necessitated his retirement. During his service he had built up a considerable reputation as a duelist and poet. He supposedly became a pupil of the philosopher

Pierre Gassendi between the time of his discharge and his joining the household of his patron, the duc d'Arpajon (1653), and this is evidenced by the definite free-thinking tendencies of his plays, *Le pédant joué* (1654), a comedy, and *La mort d'Agrippine* (1654), a tragedy. His two most famous works, setting examples for Edgar Allan Poe and Jonathan Swift, are *Histoire comique des Etats et Empires de la Lune* (1656) and *Histoire comique des Etats et Empires du Soleil* (1662), concerning imaginary voyages to the regions of the Moon and Sun.

Cyrano de Bergerac led a roisterous life in Paris, making many enemies and as many friends, and arguing with them all. In 1654 he was struck on the head by a falling beam in the house of his patron and, failing rapidly, died the following year in Paris where he had sought refuge as a free-thinker.

CYRANO DE BERGERAC, a five-act comedy in verse by Edmond Rostand, first acted in Paris, Dec. 28, 1897. The hero, always the central figure and usually the speaker, was a man of mark in his day (see biography above) as a soldier, duelist, poet, musician, and writer. Report attributes to him an abnormally large nose, disfigured by saber cuts. This nose is a main-spring of the action in Rostand's play. Cyrano twice talks of it at length. He loves his cousin, the *précieuse* Roxane. He feels that his deformity must render any suit of his hopeless if not impertinent, and makes it the task of his romantic self-abnegation to secure for Roxane the fulfillment of her love for Christian de Neuville and to defeat the evil designs on her of Count de Guiche and his complacent follower, M. de Valert. Roxane, the willing dupe of her affection, receives vows and verses inspired by Cyrano as Christian's, attributes the valor and magnanimity of one to the other, and discovers her error only years later as a widow at the bedside of the assassinated Cyrano, who is dying, as he has lived, in her service, and has her kiss "an unstained soldier's plume" as his late reward. The time of the action is 1640 and after; the scene at Paris and near Arras; the form Alexandrine verse of singular suppleness and polish, with lyrics attributed to Cyrano and reproducing admirably the temper of his time. It was Rostand's fourth play, his first notable success. Thanks in large part to the genius of the actor Coquelin the performance became a triumph historical in the annals of the Comédie Française. The play was speedily translated into many tongues and acted in many lands with success, notably in America. Among many editions may be noted that with an introduction by Cohn, A. (New York 1899) and a translation by Dole, Helen P. (New York 1899).

CYRENAICA, sîr-ê-nâ'î-kâ, or **CIRENAICA**, eastern division of the kingdom of Libya, bounded on the east by Egypt and on the west by Tripolitania, the western portion of Libya, and including the Cufra oases and part of the Tibesti Massif range. Its population is largely concentrated on the coast of the Mediterranean and on the fertile plateau, Jebel el Akhdar, a few miles inland, and consists of 98 per cent Moslems, a scattering of Jews, and even fewer Europeans. The principal towns are Tobruk, Bengasi (the seat of the Cyrenaican government), Cyrene, Derna, and Barca, and there is a railway between

Bengasi and Barca. There is extensive agriculture carried on near settlements in Jebel el Akhdar, established by the Italians in the 1930's, and cereals, olives, grapes, and dates (from the Cufra oases) are raised. Goats, sheep, and camels are tended by the nomadic hill tribes. The total area of Cyrenaica is 330,259 square miles and the population (1947 est.) is 310,000.

History.—Cyrenaica was anciently a Greek state in the north of Africa, between Marmarica on the east and the Regio Syrtica on the west and extending inland through a good part of the Sahara Desert, although the part possessed and cultivated by the Greek colonists actually occupied no more than the elevated district in the north (Jebel el Akhdar) along with the adjacent coast. It comprised five cities, called the Pentapolis—(1) Berenice (Bengasi); (2) Barca; (3) Cyrene; (4) Apollonia; and (5) Arsinoë (Tocra). In later times two more important towns were added, Ptolemais (Tolmeta) and Derna. During the most flourishing period of the history of the city of Cyrene, that town held in nominal subjection the whole of Cyrenaica, or the country lying between Carthage on the west, Egypt on the east, and Phazania (Fezzan) on the south, with the Mediterranean for its northern boundary. Cyrenaica remained independent at first as a monarchy under a dynasty of kings, the successors of Battus, who led the first colony to Cyrene; afterward as a republic, until it was subdued by Ptolemy I and annexed to Egypt. By the will of the last king of Cyrenaica belonging to the Ptolemaic dynasty, it was left to the Romans in 96 B.C., who made it along with Crete into a Roman province.

As the Roman Empire declined the attacks of the native Libyan tribes became more frequent and formidable, and the sufferings caused by their raids and by plague, earthquakes, and locusts, reduced the population and enterprise considerably. The country was overrun by Moslems in the 7th century and eventually came under the Ottoman rule.

In 1911 it was annexed, together with Tripoli, to Italy and was formed into the province of Libya (q.v.) in 1915. During World War II it was the scene of the great desert battles between the British and the Axis during the North African Campaign (1940-1942), and remained under British military rule from 1942 until its establishment as a division of the kingdom of Libya on Dec. 24, 1951.

CYRENAICS, sî-rê-nâ'îks, a sect of ancient philosophers, whose founder, a disciple of Socrates, was Aristippus, a native of Cyrene, after which city his followers were called. His great maxim was that a man ought to control circumstances and not be controlled by them. He held that the sum of life was made up of pleasure and pain; the one to be sought after as good, the other to be avoided as evil. The chief good then was the greatest number of agreeable perceptions; and the true philosopher the man who actively and successfully pursued pleasure. Every act was regarded as morally indifferent, and only to be viewed as it produced pleasure or pain to the individual. The chief successors of Aristippus were Theodorus, Hegesias, and Anniceris, each of whom became the founder of a sect. Hegesias taught that pleasure is not obtainable in life, and recommended death. As Cynicism was the forerunner of Stoicism, so Cyrenaicism

paved the way for Epicureanism, which constitutes its chief merit. See also ETHICS; HEDONISM; UTILITARIANISM.

CYRENE, town, Libya, in Cyrenaica district, in ancient times a celebrated city and the capital of Cyrenaica, founded by Battus I and a body of Dorian colonists c.630 B.C. The Battiadae were driven out in 450 B.C. and varying forms of government succeeded, both republican and tyrannical. Alexander received its submission in 331 B.C., but it soon afterward fell to the Ptolemies of Egypt and later (96 B.C.) to the Romans. It had a noted medical school and once had an estimated population of 100,000. Its commerce with Egypt and Greece was extensive in ancient towns but it is known now only through its ruins.

Explorations and excavations were made in 1821 and in 1861. In 1910 the Archaeological Institute of America began excavations there but their work was interrupted by the Italo-Turkish War. Numerous interesting remains have been discovered here, including a bath, two temples, and a magnificent necropolis, containing grottoes, façades, and monuments of various kinds. In one of the grottoes are several paintings of figures in Grecian dress. A group of Ptolemaic buildings, 3,000 terra cotta, fine sculptures, an acropolis, and Greek and Roman walls were discovered by the American expedition. Cyrene was the birthplace of Aristippus, Carneades the philosopher, Eratosthenes the astronomer, and Callimachus the poet.

CYRENE, sî-rê'nê, in Greek mythology, the daughter of Hypseus. She was carried by her lover, Apollo, into Africa and gave name to that part of Cyrenaica. By Apollo she became the mother of Aristacus.

CYRIACUS, sî-rî'â-kûs, **OF ANCONA** (Lat. name CIRIACUS ANCONITANUS; real name CIRIACO DE PIZZICOLLI), Italian antiquarian: b. Ancona 1391; d. after 1449. He had a passion for travel and to gratify it engaged in the life of an itinerant trader. He became an ardent student of the classics and on his travels engaged in the study of monuments and remains of the past. He visited Egypt, Greece, Syria, and the Aegean Islands, everywhere purchasing manuscripts, coins, and objects of art, and copying inscriptions and describing walls, buildings, and other evidences of the classic past. His collections were scattered soon after his death and but fragments of his notes and drawings remain. He was not thoroughly learned and made many mistakes, but his zeal was unsparing and to him we owe our knowledge of many monuments which have disappeared.

CYRIL, Saint, archbishop of Alexandria and one of the important fathers and teachers of the Catholic Church: b. ?376; d. 444 A.D. His episcopate (412-444) was stormy and controversial, for he lived in an age of unresolved and increasing tensions and his passionate nature did not predispose him to conciliation. A man of intemperate zeal and rigid convictions, he proved a harsh administrator. Often in open conflict with the civil authorities of the city and province, he may be held responsible, at least indirectly, for riots and even massacres in the city, including Jewish pogroms and persecution of the heathen and of schismatics. The style of his public utter

ances was often violent and provocative. Defending the privileges of his see, he bitterly resented the rising importance of the new imperial city of Constantinople. In this matter he continued a policy already established by his predecessors, especially by his uncle, Archbishop Theophilus (385-412), in whose suite he attended the unfortunate "synod of the Oak" (403), at which St. John Chrysostom was deposed.

But in no case was Cyril just an ambitious prelate or political intriguer. Whatever may be said of his autocratic and aggressive temper and of all the shortcomings of his ecclesiastical policy, in the main he stood for a sound cause. Even though at times he acted tyrannically, his sincerity and the purity of his intentions are unquestionable.

The greatest controversies in which Cyril was involved were theological and doctrinal. A staunch representative of the Alexandrian tradition, he was its last great defender. His own theology was closely linked with that of St. Athanasius. He was also strongly influenced by the ascetic spirituality of the monastic desert, in which he spent some years in his youth. Alarmed by the growth and spread of the ideas of the Antiochene school, covered by the authority of Theodore of Mopsuestia and others, he first attacked one of its rather mediocre representatives, Nestorius, who was in no sense a distinguished theologian but happened to be bishop of Constantinople. Cyril's criticism was fair and sound, and his caution against the inherent dangers of that theological trend was timely and well grounded. When the replies of his opponents proved to be evasive and inadequate, he decided to call for help from the West. This was readily granted by the pope. To suppress or settle the conflict a general council was convened at Ephesus (431).

It has been objected that Cyril's behavior at the council was hasty and despotic. The session was opened before the bishops from Asia Minor, from whom Cyril had reason to expect resistance, could arrive. It was alleged that Cyril took this step because it enabled him to control the majority of voters. Decisions were taken against Nestorius before the voice of his supporters could be heard. The "Oriental" group, refusing, upon its arrival, to join Cyril and his supporters, formed a rival council, at which Nestorius was restored and vindicated and Cyril was deposed. It was two years before peace in the church was restored and Nestorius was exiled.

But the controversy was not ended even then, and a new and violent conflict ensued after Cyril's death. His followers and successors at Alexandria went further than Cyril himself would have gone, but they invoked his authority and used his name. The doctrinal settlement was finally achieved, after stormy debate, by the Council of Chalcedon (451). While condemning the extreme adherents of Cyril, this council acclaimed him as a faithful exponent of the Catholic faith, and "Cyril's gathering" at Ephesus 20 years before was now accepted as an authentic ecumenical council. It should be added that both sides displayed excessive zeal and passion, and that Cyril's theology has been often misrepresented and misinterpreted by opponents.

Modern historians have been unduly influenced by St. Cyril's unattractive personal character, and have often failed to grasp his power as a theologian. Actually he was a great church father, a profound exponent of the Catholic truth, hold-

ing a place only a little below that of Athanasius and Augustine. A prolific writer, in his early years he was absorbed in exegesis, in which he followed the traditional method of the Alexandrian school: the "spiritual" interpretation of the Scripture. His commentary on St. John's Gospel stands comparison with those of Origen and Augustine. In later years he wrote chiefly on Christology. All these writings were polemical and apologetical. Some are available in English translation (in the *Library of the Fathers*, Oxford, 1881; the preface by E. B. Pusey is still of importance).

Consult also *The Ecumenical Documents of the Faith*, edited by T. H. Bindley (London 1899; reprinted 1950). There is no reliable monograph on Cyril in English. As an introduction, two books by R. V. Sellers may be used, but with reserve: *Two Ancient Christologies* (London 1940) and *The Council of Chalcedon* (London 1953). The best book on the subject is a collective work, *Das Konzil von Chalcedon, Geschichte und Gegenwart*, 2 vols., with third to appear, ed. by A. Grillmeyer and H. Bachit (Wuerzburg 1951-53).

GEORGES FLOROVSKY,
Dean, St. Vladimir's Theological Seminary, New York City.

CYRIL, Saint, bishop of Jerusalem: b. 2315, d. 2386 A.D. Promoted to the episcopacy about 350, he was involved in the doctrinal strife of the epoch. By personal conviction and by the tradition of his local church he belonged to the conservative group of Eastern Christians firmly opposed to Arianism but reluctant to accept in full the elaborate theology of Nicaea, as sponsored chiefly by St. Athanasius. Under pressure of the extreme Arians (the Anomoeans), St. Cyril was once deposed and, upon being restored to his see, again had to retire. He was restored to his chair only in 379. At the Second Ecumenical Council of Constantinople (381) he was acclaimed a "confessor of Faith," that is, he was honored by the church as one who, though not a martyr, had suffered great persecution in championing the faith.

St. Cyril's historical significance, however, is in his pastoral achievement. The sermons he preached to the catechumens (candidates for baptism) shortly after his ordination to priesthood at Jerusalem (probably in 347 or 348) comprise one of the most important documents of Christian literature. Though not especially original, they help us to ascertain the precise nature of the normal and habitual instruction given to the main body of believers at that time, at least in the Palestinian Church. They contain, also, precious information on contemporary sacramental rites and practices. Divided into two groups, 19 of the sermons were preached before baptism as an interpretation of the creed, and 5 (called "mystagogical") were preached after baptism and treated of the sacraments (Baptism, Chrism, and Eucharist). English translations of St. Cyril are available in various editions, for example, in *A Select Library of the Nicene and Post-Nicene Fathers*, vol. 7 of the American edition, edited by Philip Schaff and Henry Wace (New York 1890-1908).

For bibliography consult Dr. F. L. Cross' "Introduction" to his edition, *St. Cyril's of Jerusalem Lectures on the Christian Sacraments* (London 1951).

CYRIL AND METHODIUS, Saints, apostles to the Slavs, were born in Thessalonica, sons of a noble magistrate (*drungarius*). The father died while the former, whose secular name was Constantine, was still a youth. Taken under the

protection of Theoctistus the Logothete, an official of the Greek Church, Constantine (827-869 A.D.) concluded his formal education in Constantinople and for a short time held an office under Ignatius, patriarch of the Greek Church. After a brief retreat to a monastery on the Bosphorus, he was persuaded to accept a professorship of philosophy at the University of Constantinople—whence his surname "the Philosopher." During this period he went with an imperial mission to the court of the Abassid caliph. In 856 Theoctistus was assassinated, and Constantine withdrew from public life to join Methodius (826-885 A.D.), who had resigned his post as archon of one of the Slavic provinces and had retired to a monastery on Mt. Olympus in Bithynia.

The deposition of Ignatius in 858 and the elevation to the patriarchate of Photius, a friend and former teacher of Constantine, doubtless helped to explain the brothers' return to active life a little later. In 860-861 they were sent on a politico-religious mission to the Khazars, a people then settled to the northeast of the Black Sea. In the course of this journey Constantine investigated the legendary tomb of St. Clement at Khereson, in the Crimea, and recovered the presumed relics of the saint, which he was later to take to Rome, where St. Clement had reigned as pope.

Not long after the brothers' return from the Khazars, a deputation arrived in Constantinople from Rastislav, prince of Great Moravia, asking for Christian missionaries who could preach to his people in their own tongue and thus counter the Germanizing influence of the priests from Salzburg and Passau, who were working in his territory. Both their experience and their background as natives of a Slavic-speaking part of the empire made the brothers an obvious choice. Having ascertained that the Moravians possessed no writing, Constantine took the important step of composing an alphabet (almost certainly the Glagolitic, an ancient Slavic alphabet) for their use, and translated, presumably into his own Slavic dialect, the most necessary liturgical texts. When this work was finished the brothers set out (863), accompanied by a few disciples.

From the very start their task of preaching, translating, and training a native clergy was hampered by the opposition of the German missionaries; but in 867 they were favorably received in Rome by Hadrian II, who gave his enthusiastic approval to their work and to the use of the Slavic liturgy. It was in Rome that Constantine died, at the age of 42, having become a monk and assumed the name of Cyril. He was buried in the Basilica of St. Clement.

Methodius in Moravia.—After conducting preliminary negotiations for the pope with the Slavic princes in Moravia and Pannonia, Methodius was consecrated archbishop of the restored diocese of Sirmium and returned to Moravia as pontifical legate. But even this was insufficient to save him from an uncanonical trial at the hands of German bishops. For three years they kept him imprisoned in a monastery. After his release, through the intervention of Hadrian's successor, John VIII, he continued to be plagued by the intrigues of the German clergy, particularly of his own suffragan, Wiching. When Methodius died, Wiching's influence with Rastislav's successor, Svatopluk, was great enough to secure the expulsion of Methodius' disciples, who then carried forward the brothers' great pioneering work to the Slavic South and East.

Cyril and Methodius are saints in both the Greek and Roman churches.

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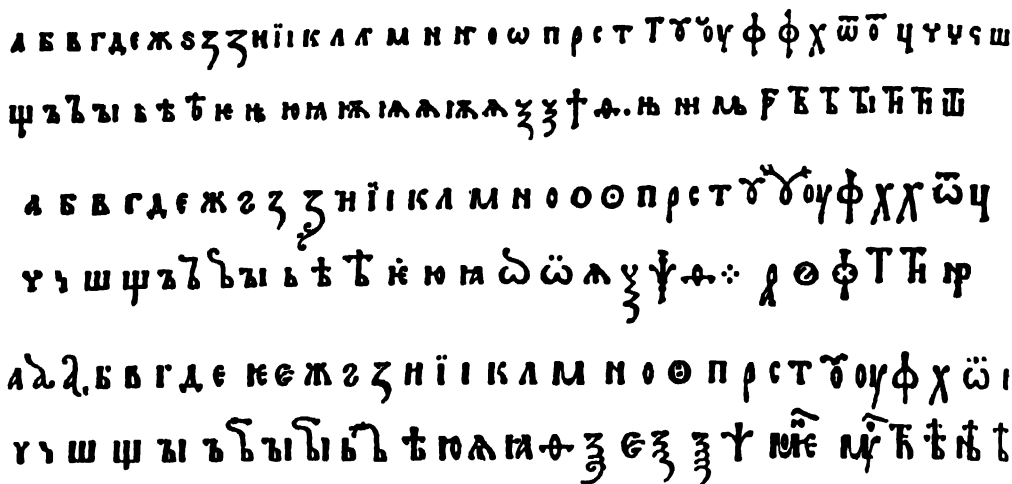
FRANCIS J. WHITFIELD.

CYRILLA, sî-ril'ă, a genus of shrubs or small trees of the family Cyrillaceae, by some authorities considered to be the only species in its genus, though others recognize as many as ten species in the southeastern United States and tropical America (*Cyrilla racemiflora*, the American cyrilla, is a small tree growing to a height of 30 feet in swamps and along streams from southern Virginia to Florida and Texas. It can be cultivated as far north as New York. The numerous flowers, which are small and white, grow in racemes that reach a length of four inches. They produce a handsome effect when in bloom. The leaves are fairly large, bright green, and persistent on the tree, in autumn they turn a gorgeous scarlet or orange, in contrast with the bright yellow fruit. The plant is also known as leatherwood, ironwood, titi, he-huckleberry, and myrtle.

CYRILLIC ALPHABET, traditional name of one of the two alphabets in which the oldest monuments of the Slavic Church are written; applied also to several later modifications of that alphabet. The implication that the Greek St. Cyril of Thessalonica (see CYRIL AND METHODIUS) was its author is by no means generally accepted. The weight of scholarly opinion favors the view that it was developed for use among the Slavs after the failure of the Moravian mission of Cyril and Methodius. In contrast to the many problems raised by the Glagolitic alphabet (q.v.) the immediate dependence of the Cyrillic on the Greek alphabet is crystal clear. The majority of its letters are Greek uncial forms, as found in liturgical texts of the 9th and 10th centuries, used with corresponding phonetic, and identical numerical, values. To these have been added letters for sound types not represented in the contemporary Greek alphabet, as for example, nasal vowels.

Admirably adapted—and further adaptable—to the needs of the Slavs, Cyrillic has won for itself a place among the world's most important alphabets, primarily as the alphabet of the Slavic peoples of predominantly Orthodox (or Greek) religious culture and tradition—Russians, Belorussians, Ukrainians, Bulgarians, Macedonians, and Serbs. In the Russian Empire and the Soviet Union it has also been used for various non-Slavic languages, and it was once the alphabet of the Rumanians and (in a modified form known as *bukvica*) of the Catholic Slavs of Dalmatia and Bosnia. Each of its modern descendants differs in small details, to fit the special needs of the respective languages. The shape of the letters in modern secular use derives from the *graždanskij šrift* (civil type) established by Peter the Great in 1710 to achieve greater conformity of appearance with Western type faces.

For more detailed information consult Lavrov, P. A., *Paleograficheskoe obozrenie kirillitskogo pisma* (Petrograd 1914-16); Ščepkin, V., *Učebnik russkoi paleografii*



From "The Alphabet: A Key to the History of Man
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Three varieties of early Cyrillic alphabets.

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FRANCIS J. WHITFIELD,
Department of Slavic Languages and Literatures,
University of California, Berkeley.

CYRUS THE GREAT, king of Persia: b. ?600 B.C.; d. 529 B.C. The chief classical sources for Cyrus' life are Herodotus, Xenophon, and Ctesias; the chief Oriental sources are the famous Chronicle of Nabu-naid, Chaldean king of Babylon whom Cyrus conquered, and his own account on the Cyrus Cylinder. It is from the last that we learn his lineage, which went back through his father Cambyses to the founder of the Achaemenian dynasty, Achaemenes.

The ancestral home of the house was Anshan, in the mountains north of Elam; but Cyrus' branch of the family ruled in Parsa, the modern Iranian province of Fars. Here the young king, upon his accession to the throne in 559, ruled as vassal of his grandfather Astyages, king of the Medes. After consolidating some ten Persian tribes Cyrus plotted the overthrow of his suzerain grandfather by forming an alliance with Nabu-naid of Babylon, who thereby saw his chance to wrest Harran, the city of his fathers, from the Medes. By 550 Cyrus had established the Medo-Persian Empire.

Lulling his powerful Babylonian ally, now a potential enemy, into false security, Cyrus in 547 moved westward to consolidate his Median conquests and to attack Croesus, king of Lydia, before Babylon or Egypt could come to the rescue. He boldly invaded Lydia and captured Sardis in early winter, a defiance of the royal convention that would have taken him home for winter quarters. These operations extended his rule to the Aegean Sea. While he waited for Nabu-naid's ineptness and Babylon's internal dissension to ripen that kingdom for his "liberation," Cyrus (545-540) extended his rule eastward to the south and north of the Hindu Kush Mountains. The pacification of the northeast marches in Transoxiana and the barring of the advance of the Turanian nomads west of the Jaxartes gave security to his empire. Thus Cyrus doubled his domain and added 50 per cent to its popula-

tion, but the security he achieved went far beyond these gains in value.

Meanwhile, in 546 Gobryas, one of Nebuchadnezzar's ablest generals, had revolted. By turning to Cyrus he made possible the incorporation of Elam into the Medo-Persian Empire as its third-ranking satrapy. This same general in 539 marched into Babylon almost unopposed, and a fortnight later welcomed the great Cyrus as liberator of the Marduk-worshiping Babylonians from the tyranny of the interloping Chaldean dynasty.

Cyrus' Qualities of Greatness.—Cyrus then demonstrated that policy of humanity and tolerant autonomy for conquered peoples that by 500 B.C. had swept Persian arms and rule to the Danube and the Nile's first cataract. A new era was thus inaugurated in southwest Asia. All those gods which the archaizing, fearful Nabu-naid had brought to Babylon for safety, Cyrus returned to the Mesopotamian cities. He gave the captive Jews permission to return to rebuild Jerusalem and to take with them the captured gold and silver utensils of Solomon's temple. The Jews' return to Zion might not have literally conformed to the Second Isaiah's glorious predictions (chapters 35, 40-55), but the policy of Cyrus undoubtedly justified the prophet when he called this great monarch the "Anointed of Yahweh" (45:1). By conquering Phoenicia Cyrus gained a capable navy to control the Mediterranean and to help subdue Ionia.

Strong and magnanimous, just and humane, this warrior-statesman's enlightened policy of tolerance toward local peoples and cultures, his encouragement of agriculture, commerce, and trade, his genius for efficient and just administration, helped inaugurate a new era in the ancient world and justified the title of "Great," which his contemporaries and posterity conferred upon him.

Cyrus held court in ancient Susa, Babylon, and Ecbatana; but his favorite capital was at Pasargadae, on the uplands of his native Parsa, where he built beautiful palaces amid extensive parks and where today one may read on a surviving pillar: "Cyrus, great king, Achaemenian." Here he was buried in the simple rock tomb he

himself prepared—the father of his people, liberator of the Jews and many others, great ruler and legislator to the admiring Greeks.

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T. CUYLER YOUNG,

Director of Near Eastern Studies, Princeton University.

CYRUS THE YOUNGER, king of Persia: b. about 424? B.C.; d. 401 B.C. He was the second son of Darius Nothus, and at 16 obtained the supreme power over all the provinces of Asia Minor. His ambition early displayed itself; and when, after his father's death (404 B.C.), his elder brother, Artaxerxes Mnemon, ascended the throne, Cyrus formed a conspiracy against him, which was, however, discovered. Cyrus was arrested by his brother and condemned to death, but at the intercession of his mother Parysatis, was released and made governor of Asia Minor. Here Cyrus assembled a numerous army to make war upon Artaxerxes and dethrone him. Being informed of his brother's design, Artaxerxes marched against him with a much larger army. In the plains of Cunaxa, in the province of Babylon, the two armies encountered each other (401 B.C.). In the battle that ensued the troops of Cyrus were at first victorious, but the fruits of the victory were lost through the death of Cyrus himself in the battle.

An account of the life of Cyrus is contained in the opening book of Xenophon's *Anabasis*, which gives a detailed account of the retreat of the Greek auxiliaries of Cyrus from the interior of Persia to the coast of the Black Sea. Another account by Ephorus is preserved in Diodorus. Excerpts from Ctesias by Photius also throw light on the career of Cyrus, as also the life of Artaxerxes by Plutarch. The character of Cyrus is highly praised by the ancients and it appears that he was certainly his brother's superior in energy and as a statesman and general. The fate of the empire would probably have been very different had he ascended the throne. See also PERSIA—IRAN.

CYSTICERCUS, sīs-tī-sūr'kūs, the larval stage of a tapeworm, developing in man after he has eaten the eggs of *Taenia solium* (the pork tapeworm) or *T. saginata* (the beef tapeworm). These eggs give rise only to larval forms in man. The complete development of tapeworms from them fails to take place unless the larval stage is passed in some other mammal than the one that has the tapeworm. Human beings acquire tapeworms from taking in segments of the adult worm or the larva. Usually these come from contaminated pork or beef. When an egg is ingested, the six-hooked embryo that hatches from it travels to various parts of the body, such as the liver, muscles, brain, or eye, and there develops into a cystercus, a shiny saclike body some 15 millimeters long. It is filled with liquid and is often called a bladder worm. The minute larvae eventually become encysted in the tissues and are calcified. If present in large numbers they cause a variety of symptoms, depending on their location. Commonly they cause pain and stiffness in the muscles, pain in the joints, or painful skin nodules. Their presence in man is

known as cysticercosis. Careful government inspection of pork and beef, or thorough cooking, will give ample protection against it.

CYSTINURIA, sīs-tī-nū'rī-ā, the presence of cystine, an amino acid, in the urine. This is a rare inborn error of metabolism which causes from 0.4 to 1.0 grams of cystine to be excreted daily in contrast to a normal of 0.1 gram. Cystine calculi in the shape of crystals may be deposited in certain organs of the body—such as the bladder, kidney, and ureter. No cure has yet been found.

CYSTITIS, sīs-tī'tīs, an inflammation of the urinary bladder. See BLADDER—*Diseases of the Bladder*.

CYSTOIDEA, an order of extinct echinoderms. They are spheroidal animals, pedunculate or sessile, enclosed by polygonal calcareous plates. They have a mouth above; the arms are rudimentary. Buch first elucidated their structure and affinities in an essay published at Berlin, in 1845, and gave them the name of *Cystideae* in place of *Sphaeromites*, which was their original appellation. Now *Cystideae* has become *Cystoidea*. They range from the upper Cambrian to the Silurian, being especially prominent in the Bala Limestone.

CYSTOPTERIS, sīs-tōp'tēr-is, bladder fern, a genus of delicate flaccid polypodiaceous ferns. They are found in moist, cool localities. *C. fragilis*, the brittle fern is found in North America, as is the very rare *C. montana*. The brittle fern has a wide range, which extends from within the Arctic Circle to Chile, South Africa, and Australasia. They have dotlike sori covered by hoodlike indusia. *C. bulbifera*, which multiplies by bulbets, is found in the northern Appalachians.

CYSTS, sacs with distinct walls containing fluid or other material. They are described in various ways according to location or content. Sometimes cysts contain a specific fluid, such as blood or chyle. A *dermoid* cyst contains hair and sebaceous material. Sebaceous cysts are found in connection with sweat glands. Other well-known examples of cysts are: *echinococcus*, found in the liver; *meibomian*, observed in the eyelid (it is also called a chalazion); *pilonidal*, seen at the base of the spine; *ovarian*, arising in the ovary.

CYTHERA. See CERIGO.

CYTHERE, sī-thē'rē, a genus of minute crustacea of the order Ostracoda and the family Cytheridae. *Cythere* is a marine form allied to the fresh-water genus *Cypris*. The body is short, indistinctly segmented, and completely enclosed within a bivalved carapace. The two pairs of antennae serve as swimming organs, and are followed by not more than five pairs of body appendages. A single eye is present, but the heart is lacking. The young hatch as nauplius larvae.

CYTHEREA, sīth-ēr-ē'ā (from Cytherea, a name for Venus), a genus of conchiferous mollusks belonging to the family Veneridae. The shell is like that of the genus *Venus*. There are three cardinal teeth and an anterior one be-

neath the tunicle. The cythereas are in all seas; about 176 recent species are known and 200 fossil, the latter ranging from the Oölite down.

CYTISINE, sīt'ī-sēn, a toxic vegetable alkaloid, $C_{11}H_{14}ON_2$, belongs to the nicotine group. The substance is derived from the seeds of *Cytisus laburnum*, the laburnum tree of Europe, and from others of the same genus. The ripe seeds are powdered, extracted with dilute acid, and a crude product is precipitated with lead acetate and tannic acid; it then is dried, and extracted with alcohol. On evaporation pure crystals are obtained. Sublimation is possible in a current of dry hydrogen. The lupanine alkaloids, of which cytisine is a representative, are of interest because of their presence in lupin seeds, which are used as animal feeds. A dose of 0.1 to 0.5 gram is fatal to small animals.

CYTISUS, sīt'ī-sūs, a genus of shrubs or small trees of the pulse family, Leguminosae. It includes about 60 species, chiefly of the Mediterranean region. Commonly known as "brooms," they are often confused with species of *Genista*, the woadwaxen, from which they differ by having strongly angled stems and very small leaves or leaflets, while in *Genista* the stems are terete and the leaves, all simple, are at least a half inch long or longer. In *Laburnum*, another closely related genus, all the leaves are compound, with three leaflets. Furthermore, the flowers are borne in terminal, mostly long, pendulous clusters, which give rise to the common name "golden chain." Some species of *Cytisus* make handsome subjects for rockeries; others, such as *C. canariensis*, the Canary broom (the "genista" of florists), are popular as greenhouse plants, blooming profusely in early spring. *C. scoparius*, the Scotch broom, is naturalized in many places in North America. It thrives in dry sandy soil from Nova Scotia southward and also on the Pacific coast. See also BROOM.

CYTOLOGY, that branch of biology which deals with the structural organization of the cell, with the chemical composition and the biochemical properties of its components, and with the interrelations between those components which result in the various activities characteristic of life.

The invention of the microscope in 1600 or thereabout opened the way for a study of the minute structure of living things. In 1665 Robert Hooke looked at a piece of cork and found that "it was perforated and porous much like a honeycomb . . . ; these pores or cells were not very deep but consisted of a great many little boxes. . . ." After Hooke many other investigators saw such "cells" or "vesicles" in parts of plants and animals. It was not until the early 19th century that those observations led to the establishment of a fundamental principle of biology, the cell theory. This theory, now universally accepted, maintains that all living things, no matter how small or how big, are made of cells, microscopic units that are fundamentally alike. They are in a sense the atoms of biology, since they are the smallest units that can exist independently and still show all the properties of life. Some organisms are single cells, others contain many millions. The human body for instance consists of about 30 billion cells.

Though we know very little about the origin

of the first cells on earth, it is thought that at some time in the past a primitive cell took shape out of less organized matter. Cells as we know them today, however, would seem to originate only through the division of pre-existing cells.

The important aspect of cellular organization lies not so much in the fact that organisms are subdivided into walled compartments as it does in the nature of the cell content, which is called protoplasm. Some very large seaweeds, for in-

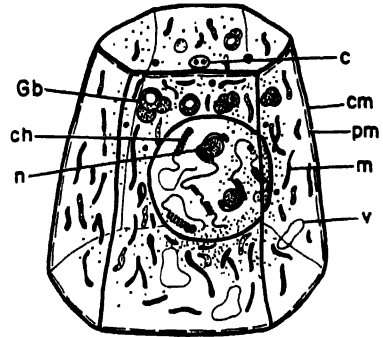


Fig. 1. Diagram of a typical animal cell. c, centrosome with 2 centrioles; cm, cell membrane; pm, plasma membrane; m, mitochondrion; v, vacuole; n, nucleolus; ch, chromosome; Gb, Golgi bodies.

stance, contain the protoplasmic equivalent of thousands of cells, but all within a single compartment, without subdivision by cell walls.

This cell content—or protoplasm—is itself made up of smaller units, or organelles, each with a characteristic structure and with a specific function. The organelles cannot exist by themselves, but only in relationship with one another. It is this complex interaction of the protoplasmic units which produces the living cell.

Some of these units are present in all cells, for they carry on the fundamental functions of

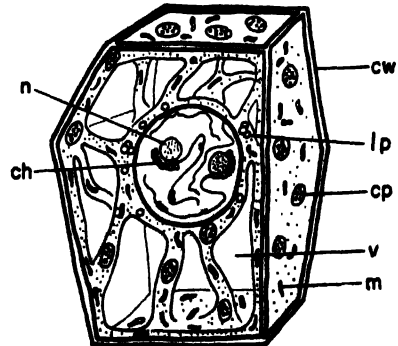


Fig. 2. Diagram of a typical plant cell. n, nucleolus; ch, chromosome; cw, cell wall; lp, leucoplasts; cp, chloroplasts; v, vacuole; m, mitochondrion.

living matter. Others are related to specialized tasks and therefore occur only in certain cells. In many-celled animals and plants, a division of labor has led to the development of a great variety of cell types, such as nerve cells, muscle cells, gland cells, and others. Each has its own specialized protoplasmic structures, adapted to its own individual tasks.

Figs. 1 and 2 are diagrams of a typical animal and a typical plant cell. Both contain a nucleus with chromosomes and nucleoli, mitochondria.

vacuoles, a plasma membrane, and secondary cell membranes or walls. In animals and some lower plants there is a centrosome with centrioles. The Golgi bodies are found in animal cells, but apparently there is nothing corresponding to them in plants. Plastids, on the other hand, are characteristic of plants that can synthesize their own organic substances. The cells of most plants are inclosed in a stiff wall containing cellulose.

The progress in our knowledge of cells is closely linked to the development of new methods and instruments. Refinements of the microscope, of the microtome, which prepares thin slices of tissues down to 1 micron ($\frac{1}{1000}$ of a millimeter) in thickness, and of various staining techniques to make cell structures visible have led to the discovery and description of the major formed elements of the cell. The killing and preservation of cells with chemicals does, however, cause some degree of distortion and artifact formation. Because of the great transparency of living cells their study until recently remained very unrewarding. The phase microscope has now overcome this difficulty, and things that before were visible only after killing and staining can now be studied in the living cell as it is seen either in small organisms, in fragments of tissues, or in tissue cultures.

A New Era in Cytology.—Even the best light microscope cannot reveal any structure below 0.2 microns. The invention of the electron microscope (q.v.) moved this limit of visibility down to about $\frac{1}{500}$ of a micron resolving details a hundred times smaller than those visible before, and even reaches into the range of large molecules. With the help of improved killing fluids and of machines that can slice cells into sections only $\frac{1}{40}$ of a micron thick, the electron microscope has opened a new era in the study of cellular structure.

Two other techniques are speeding progress in the study of the submicroscopic morphology of cells. The polarizing microscope shows us how some of the molecules are arranged in protoplasmic structures, and X-ray diffraction studies are giving information as to the architecture of the most important molecules that form the building materials of cell components.

Thus the knowledge of cell architecture is pushed into the realm of molecules and atoms. The study of the chemical compounds that build up protoplasmic structures is one of the most active branches of cytology today. Some of the cell components can be isolated in large quantities by breaking the cells. This is achieved by putting the cells in salt or sugar solutions and then separating the particles in suspension by centrifugation, that is, the action of centrifugal force. The process is often called cell fractionation. Nuclei, chromosomes, nucleoli, mitochondria, plastids, and pigment granules have thus been prepared for analysis. Of course this method only tells us about the average composition of the many millions of nuclei, mitochondria, and similar formations remaining in the test tube. Substances that are soluble in the salt or sugar solutions are lost.

Fortunately there are also methods available that allow a limited chemical analysis to be made by using microscopic preparations of cells that have been fixed in chemicals calculated to preserve the substances under study as they exist in their natural position in the cell. Still better preservation is achieved by rapidly freezing cell

material at -190°C . and then drying it in a vacuum at -40°C . The chemical analysis of cells through the microscope is called cytochemistry.

One of the most useful tools of the chemist is the spectrophotometer. This instrument enables the observer to tell substances apart and also to measure the amount of each substance present by noting the manner in which it absorbs different wave lengths of light. Methods have been developed to make such measurements of individual cell structures through the microscope, using light from the ultraviolet through the visible wave lengths into the infrared parts of the spectrum. The process is called microspectrophotometry.

Some substances can be recognized from the color they give when treated with certain test reagents under the microscope. In a few instances the amount of a substance under observation can be determined by measuring the light absorbed by the colored structure. These microscopic methods are extremely sensitive and can determine quantities of the order of one billionth of a milligram.

Another cytochemical technic recently developed makes use of the characteristic absorption of X-rays by the chemical elements. The amounts of certain elements in a cell component can thus be determined, as well as the total of all atoms—or, in other words, the total mass of a cell structure.

Mitochondria.—With these new tools at his disposal the cytologist, with the help of the biochemist and biophysicist, has made rapid progress

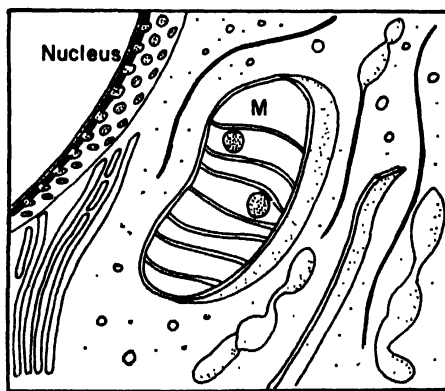


Fig. 3. Thin section through a cell, seen through the electron microscope. Enlarged about 30,000 times. M, a sectional view of a mitochondrion. Also some of the submicroscopic membranes, tubules, vesicles, and fibers.

in the understanding of cell structures and their activities. In the cytoplasm mitochondria have been investigated most intensively. An average cell contains several thousand of these very small rod-shaped or filamentous bodies. The electron microscope has revealed their delicate inner architecture (Fig. 3, M) and the biochemist has shown that they have an astounding biochemical organization, for they contain the complex enzyme systems of cell respiration, which are mainly responsible for getting the chemical energy out of the foodstuffs and making it available for growth and special cell function. Mitochondria may, therefore, be called the "powerhouse" of the cell, since so many of the energy-yielding reactions occur in them. These are essentially similar in all cells. They are similar in their structure and

also in many of their enzymes and in the functions they perform. In addition, the mitochondria in some cells have been found to carry enzymes for the synthesis of specific compounds, such as urea in the liver. Many recent observations indicate that there are several types differing slightly from one another according to the biochemical functions they perform.

Plastids.—The plastids (q.v.) of plants are said by some to differentiate from mitochondria as the plant develops, but there is no proof for this contention, and the evidence rather indicates that they are independent structures. Like mitochondria they carry out definite and fundamental biochemical reactions and consist of organized enzyme systems. The chloroplasts contain chlorophyll, the molecule that captures the energy from light and makes it available for the synthesis of organic substances on which all animal life depends (photosynthesis, q.v.). There is both theoretical and practical interest in the way the plant cell accomplishes it, and, therefore, in the structure and chemistry of plastids.

In most higher plants the plastids contain small cylindrical bodies, the grana. With the electron microscope one can see that these grana are made of many thin disks, one on top of another, like a many-layered sandwich. Studies with the polarizing microscope suggest that disks of protein alternate with layers of lipids. And certain observations indicate that the chlorophyll is spread in between these wafers in layers one molecule thick. When grana are absent the whole chloroplast is made of a stack of thin layers. It is interesting that the visual elements in the eye, which also absorb light energy that starts chemical reactions, have a similar structure.

The structures named after Camillo Golgi are still a puzzle to cytologists. They were usually described as a filamentous or membranous network, or system of canals, made visible in the killed cell by immersion for several days in osmium tetroxide. In the living cell no such structures have been satisfactorily demonstrated. As a matter of fact, recent work makes it appear likely that the various structures described as "Golgi apparatus" are really artifacts (artificial structures or appearances) produced during the killing of the cell. In the living cell, and also in the dead cell treated so that fatty substances are well preserved, we find, instead, granules, droplets, and spheres with vacuoles (tiny cavities) that often contain protein or fats and oils. They vary in number, appearance, and location, depending on the physiological state of the cell. What little is known about their function indicates that they have something to do with the formation of various secretions by the cell.

Centrosome.—The centrosome (q.v.), a structure in the cells of many animals and lower plants, is best known from its role during cell division (Fig. 4). It is a small sphere of cytoplasm containing two minute granules, the centrioles [Fig. 1 (c)], and usually lying near the nucleus. In many insects the centrioles are larger and are rod-shaped. They are connected with the development of locomotory organelles in certain cells, that is, with either a flagellum or many cilia. These mobile projections of the cell have a remarkable structure. Studies with the electron microscope have shown them to be built on the same plan whether in protozoa, algae, on the gills of a clam, in cells in the human

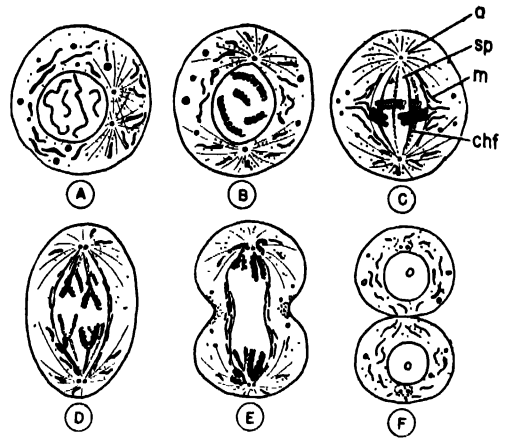


Fig. 4. A cell undergoing division. (A), early prophase (B), late prophase, chromosomes condensed into spirals. (C), metaphase, chromosomes line up in the midplane of the spindle (a, aster with centriole, sp, spindle; m, mitochondria; chf, chromosomal fibers) (D), anaphase, chromosomes move to poles of spindle (E), telophase, chromosomes begin to unravel, cytoplasm is divided by cleavage furrow. (F), interphase of the two new cells.

body, or in the tail of sperm cells. Inside a thin membrane, and embedded in a structureless material, there are eleven tiny fibers, two in the center and nine around the periphery. We can visualize the way in which rhythmic contractions of those fibers can cause the complex motions of these minute propellers.

The microscopic components of the cell are embedded in a more or less viscous material that behaves like a liquid in that it flows, rises in a capillary, and rounds up into a drop when taken from the cell. But it is like a solid in at least one respect, for it shows some degree of elasticity. It also can set into a gel and liquefy again. This behavior has been explained by assuming that the material consisted largely of submicroscopic elongated particles, large molecules (for instance, of protein) or groups of molecules. When these are folded up or in low concentrations they easily glide by one another. In higher concentrations or when they are unfolded they get tangled up in various ways or even get firmly attached to one another, so that the whole mass finally sets into a solid gel.

The electron microscope is now revealing some of the organization in this material. Systems of minute tubules, rows of vesicles, straight and twisted fibers, small granules, and thin membranes are seen between the microscopically visible elements. When cells are ground up and nuclei and mitochondria are removed by centrifugation, a fraction of very small, formed elements remains and can be collected in the high-speed centrifuge. They are called microsomes, and no doubt correspond mainly to fragments of the submicroscopic elements mentioned above. This is of interest because the biochemists have found that this microsome fraction contains the parts of the cell which are most active in the building of new protein molecules.

Nucleus.—Separated from the cytoplasm by a special membrane are the components of the cell nucleus—chromosomes and nucleoli. Chromosomes are most easily seen at the time of cell division. They appear to be made of fine threads that coil up into a regular spiral during cell

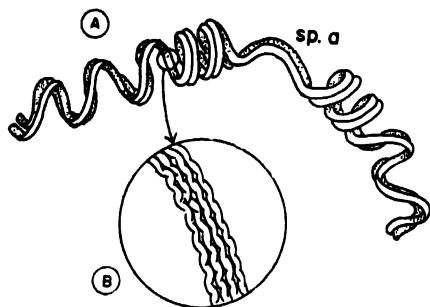


Fig. 5. Diagram of a chromosome during early part of cell division. (A), chromosome spiral and half-chromosomes (chromatids) seen in the light microscope (sp. a, spindle fiber attachment). (B), short section of the chromosome at much higher magnification showing the microfibrils visible in the electron microscope.

division (Fig. 5). When they are thus condensed they can be counted; and it has been found that their number is characteristic for a given species of plants or animals. In the nucleus of the non-dividing cell the chromosomes are largely unraveled except for those in special regions where they seem to be darker, partly because the fibers there remain tightly coiled. They also are swollen, so that in most nuclei they leave no space between them. That is why in the living cell they are usually not visible as separate bodies and the nucleus seems to be a clear vesicle.

In some cells chromosomes have rather unusual shapes. There is no agreement as yet on the interpretation of the various types. The basic structure of chromosomes will not be understood until they have been thoroughly studied with the electron microscope. So far they have been rather difficult to prepare for electron microscopy. Preliminary work has indicated that chromosomes from very different organisms are all made up of very similar coiled fibrils, so thin that individually they are invisible in the light microscope [Fig. 5 (B)].

Chromosomes and Heredity.—The discovery of the role of chromosomes (q.v.) in heredity has been one of the great achievements of biology. Like begets like because there are in the chromosomes certain patterns of molecular arrangement that have great constancy and that direct the multitude of those chemical reactions in the cell which finally result in characteristic shapes and functions. From cell to cell and generation to generation chromosomes are handed on as the physical basis of constancy and continuity, but also, where rare rearrangements or mutations in those molecular patterns occur, the chromosomes provide the raw material for evolutionary change.

Not much is known as yet about the metabolic function of the nucleus, though experimental removal of nuclei from cells shows that not only cell reproduction but also any prolonged activity and survival are impossible without the nucleus. In this activity not only chromosomes but the nucleoli as well are definitely involved. Variable in shape and formed on a specific region of certain chromosomes, nucleoli change in size and chemical make-up, depending on the metabolic activity of the cell. What specific function they perform is still a mystery.

CELL REPRODUCTION

One of the basic problems of cytology is the method of cell growth and reproduction. Growth means the synthesis of new protoplasm—that is

to say, its formation out of simpler chemical compounds. The process may involve no more than the synthesis of new cytoplasmic organelles, or it may affect both cytoplasmic and nuclear units. If the duplication of nuclear units is followed by nuclear and cell division, cell reproduction results. There will be two complete cells instead of one.

How do new organelles originate in a cell? Can they be synthesized anew by the cell or do they arise only from pre-existing organelles? Chromosomes, we know, originate only by the duplication of chromosomes already existing. At the present time, studies of the cytoplasm tell us that only centrosome and plastids can claim such autonomy, though certain observations suggest that there are other "self-duplicating" units. This is a question of great importance for many fundamental problems of biology. Cytoplasmic units of this kind could be carriers of inheritance through the cytoplasm. The selective loss of one or another of such units during growth has been suggested as an explanation for the development of the various specialized types of cells and for the fact that cells that have once become specialized never revert to their original form.

The main features of cell reproduction were discovered in the last quarter of the 19th century. The most striking aspect of the process is the behavior of the nucleus upon the appearance in it of certain threadlike organelles called the chromosomes. It is these fine threads that give the process of nuclear division its scientific name of "mitosis"—from the Greek word for "thread." Elaborate mechanisms assure the equal distribution of the chromosomes to daughter cells. In other words, the division of a cell is the end result of a number of processes, normally linked in a regular series. This begins with the duplication of the chromosomal fibrils, continues through the splitting of the entire bundle into equal halves, and the coiling of the chromosomes into compact units, and closes with the beautifully exact movements on the nuclear spindle which finally lead to the cleaving of the cytoplasm into two new cells (Fig. 4).

We are still far from understanding all the phenomena involved in the reproduction of cells. Perhaps most fundamental is the process by which the cell makes exact duplicates of the chromosomes. Some scientists hope to find the explanation of the mystery in the special structure of deoxyribonucleic acid. They point to the fact that the amount of this substance per chromosome is remarkably constant in all cells of a given species. Then there is the recent discovery that a molecule of the acid consists of twin fibers wound around each other spirally. A model for the duplication of at least this molecule is suggested by letting the twins separate and then synthesize, each one producing a new partner after its own image.

The equal distribution of the chromosomes between the daughter cells is accomplished by special organelles: (1) the nuclear spindle, a gel of oriented (especially arranged) protein fibers, in which the chromosomes are embedded, and (2) the chromosomal fibers which connect a special region on the chromosome (spindle fiber attachment) to the spindle. The spindle may be likened to the stage of a theater. On it the chromosomes, like marionettes, are moved about by the contractile chromosomal fibers. First they are neatly lined up in the midplane of the spindle. [Fig. 4 (C)]. Then, as the halves separate from each other, the

sets of daughter chromosomes are pulled apart to the spindle poles. The stretching of the spindle still further helps to separate the daughter chromosomes [Fig. 4 (D)]. The cleavage furrow, a specialized, contractile part of the gel-like cell cortex (or outer layer) then subdivides the cytoplasm into roughly equal parts.

The development of organisms from the egg cell, the healing of wounds, the abnormal growth of cancers are some of the biological problems whose understanding depends on a better knowledge of the factors that control cell multiplication. What are the internal and external conditions that force the cell to channel its energy from growth or special function into the chain of events that leads to cell division? What are the temporary or permanent changes in the biochemical make-up of the cell that allow all the busy processes of life to go on but prevent mitosis? At present we can only ask the questions and make some guesses. The answers await a more detailed knowledge of the biochemical reactions that are involved in the specialized activities of cells, in cytoplasmic growth, in the synthesis of chromosomes and other cell organelles, and in the controls and switches that determine which reactions can go ahead and which are stopped.

Since living things are made of cells and cell products, the progress of cytology greatly influences all branches of biology. The rapid growth of cytology in the 19th century had a tremendous influence on all aspects of biology. We can expect that the new expansion of cell research today, allied with the biochemistry and biophysics of the cell, will have a stimulating effect on many other fields of biology. See also BIOLOGY; CELL, THE.

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HANS RIS,

Department of Zoology, University of Wisconsin.

CYTOPLASM, the protoplasmic contents of the cell outside of the nucleus. See CELL, THE; CYTOLOGY.

CYTOSINE, sī'tō-sēn, $C_4H_5N_3O$, is also known as 2-oxy-6-amino pyrimidine. It is one of the disintegration products of nucleic acids, being present along with uracil and thymine. Its structure is that of a ring of four carbon and two nitrogen atoms, the carbon that is between two nitrogens being doubly linked to oxygen, while an amino, NH_2 , group is attached to one of the other carbons.

CYZICUS, siz'ī-kūs, ancient city, Asia Minor on the isthmus leading to Cyzicus (modern Kapi-daği) Peninsula. The city was largely destroyed by the Arabs in 675 A.D. but there are extant ruins of the beautiful temple of the Emperor Hadrian dedicated 167 A.D. and of a large Roman amphitheater, dating from the 2d century.

CZACKI, chāts'kē, Count Tadeusz, Polish statesman: b. Poryck, Volhynia, Poland, Aug. 28, 1765; d. Dubno, Poland, Feb. 8, 1813. In early youth he was employed in the Superior Court of Justice at Warsaw. He was deeply

interested in the economic and educational development of Poland, the rivers of which he mapped. He taught at Kraków for a time when his estates were confiscated during Poland's second partition; after Paul I restored them he devoted the rest of his life to education. Czar Alexander I made him inspector of schools in Volhynia, Padolia, and Kiev. He founded the famous lyceum at Kremenetz, long a Polish intellectual center, donated a great part of his private fortune to education, and also a valuable library. Charged with stirring up Polish nationalist sentiment in 1807, he so well defended himself that the czar gave him a high post in Russian Poland's educational system. His works, mainly archaeological and historical, were published in three volumes (Posen 1843). His most important work is *On Lithuanian and Polish Laws*, 2 vols. (1800).

CZAR, zār, **TSAR**, tsār, the title of the former emperors of Russia, derived from the Old Slavonic *cesar*, king or emperor, which, although long held to be derived from the Roman title *Cæsar*, is almost certainly of Tatar origin and is a survival of Asiatic dominion in Russia, as may be judged from the fact that there were czars of Georgia and other khanates, evidence of the non-imperial content of the term. In the beginning of the 10th century the Bulgarian prince Simeon (Symeon) assumed this title, which remained attached to the Bulgarian crown. In 1346 it was adopted by Stephen Uros IV (Stephan Dusan), king of Serbia. Among the Russians the Byzantine emperors were so called, as were also the khans of the Mongols that ruled in Russia. Ivan III (Vasilievich), grand prince of Moscow, held the title, and Ivan IV (Vasilievich), caused himself to be crowned as czar in 1547. With the conquest of Little Russia and Smolensk the rulers of Russia assumed the title of Czar of All the Russias. In 1721 the Senate and clergy conferred on Peter I (the great), in the name of the nation, the title Emperor of Russia, for which in Russia the Latin word *imperator* is used. But among the Russians the common designation of the emperors was czar, or, as it is sometimes spelled, tsar.

CZARTORYSKI, chār-tō-ris'kē, Polish-Lithuanian noble family, the members of which include:

PRINCE FRYDERYK MICHAŁ CZARTORYSKI (1696-1775): Polish statesman who had considerable influence on Polish foreign policy during the reign of Augustus III of Saxony.

PRINCE ADAM KAZIMIERZ (CASIMIR) CZARTORYSKI (1734-1823): Polish statesman and general, was an unsuccessful candidate for the Polish throne in 1763 upon the death of Augustus III. His daughter, PRINCESS MARYA CZARTORYSKI (1768-1854), duchess of Württemberg was a novelist, and his son PRINCE ADAM JERZY CZARTORYSKI the most important member of this branch of the family, served his country with distinction. He was born in Warsaw, Jan. 14, 1770; d. Paris, July 16, 1861. He was educated by private tutors, fought for his country and, after the 1795 partition, was a hostage in St. Petersburg where he formed a friendship with Grand Duke Alexander who, upon his accession, gave him direction of Russia's foreign affairs. Prince Adam signed the 1805 alliance with England. Two years later he was superseded, but retained the czar's good will. On the

outbreak of the Polish revolution of 1830 he showed himself active on behalf of his country, and was chosen president of the Provisional government (18 December). On 30 Jan. 1831 he became the head of the national government, and gave up the half of his property to the service of his country. On the appointment of Krukowiecki to the dictatorship, Czartorski resigned his post as president of the Senate. In the last days of the struggle for freedom he served as a common soldier in the corps of General Romarino. Thenceforth he lived at Paris, ceaselessly engaged in aiding his needy fellow-countrymen. He was excluded from the amnesty of 1831, and his estates in Poland were confiscated. In 1848 he liberated all the serfs on his estates in Galicia, and during the Crimean War endeavored to induce England and France to identify the cause of Poland with that of Turkey. Alexander II offered him an amnesty which he refused. Consult his *Mémoires et correspondance avec l'empereur Alexandre Premier* (Paris 1887; Eng. trans., London 1888); Morfill, *Story of Poland* (ib., 1893); Zaleski, *Life of Adam Czartoryski* (Paris 1881); Gadon, *Prince Adam Czartoryski* (Cracow 1900). See also POLAND.

CZASLAU, chäs'low, Bohemia, Czechoslovakia, a town in a district of the same name; located in a fertile plain, 45 miles east-southeast of Prague; and is memorable for the defeat which the Austrians sustained from Frederick the Great in 1742. The church Saint Peter and Saint Paul has the loftiest steeple in Bohemia, and contains the remains of the celebrated Hussite leader, John Ziska. Alcohol, beer, beet sugar and pressed yeast are the principal manufactures. The population is 9,190, mostly Czechs. The district is well wooded and very fertile, yielding excellent crops of corn and flax; and large quantities of minerals, especially iron. Area 233 square miles. Pop. about 61,100.

CZECH LANGUAGE. See **BOHEMIAN LANGUAGE.**

CZECHOSLOVAK LITERATURE.

Early History.—Vernacular literary activity among the West Slavs living in the area now known as Czechoslovakia can be clearly traced as far back as the latter part of the 9th century. German missionaries, not knowing the Slavic language, had met with little success in their efforts to Christianize the natives. In 863 two brothers from Salonika (Thessalonica), Constantine, who later took the name Cyril, and Methodius—were sent to Moravia and Bohemia by the Byzantine Emperor Michael III at the request of Prince Rastislav, the ruler of the Great Moravian Empire. They brought with them the liturgy in Old Church Slavonic, and translated parts of the Bible into the vernacular. For the next three and a half centuries Old Church Slavonic occupied a more or less dominant place in ecclesiastical circles (see also **OLD CHURCH SLAVONIC LANGUAGE AND LITERATURE**). But evidences of a local vernacular are distinct from the end of the 9th century. The so-called *Kiev Letters* and the *Prague Fragments*, in their original form, thought to be dated c.900, are the earliest extant remnants of this early native literature. But soon saints' legends began to be popular, influenced by Western models, and not only the protoapostles

Cyril and Methodius (see **CYRIL AND METHODIUS**), but local saints, Ludmilla (d. c.921) and Václav (d. 929) were the subjects of *vitas et legendae* written by Bohemian Slavs in Latin. The form in which these hagiographies are now extant is generally attributed to a period at least a century after the death of these early writers. The liturgical response "Hospodine pomiluj ny" (Lord, have mercy upon us), formerly thought to belong to the late 9th century, is now regarded as most probably of the late 11th century. By that time the Eastern Church rite had lost most of its influence and the Western orientation of these Slavs was accepted. Latin culture and ecclesiastical usages and traditions henceforth dominated.

The predominance of Latin culture in all areas of the life of the Czech and Moravian peoples necessarily meant the infiltration of Western norms and motifs in literary creation. The vernacular hymn *Svatý Václave, vevodo české země* (*Saint Václav, Duke of the Czech Land*), is the best-known of a number of native compositions that arose in the 12th century, inspired by, and largely imitative of, Western Latin models.

The political conditions of the 13th century were not favorable to the growth of vernacular literature. The Přemyslid kings from Přemysl Otakar I (Ottokar) to Václav III favored German clerics and the German bourgeoisie. The royal income from the taxes paid by the German burghers was sufficient to make the kings independent of the native feudal nobility. The use of the German language at the royal and the princely courts grew to such an extent as to smother the native Slav, which soon became the language of the peasant and the serving classes. Yet in spite of this adverse situation, Czech verse translations of numerous Latin saints' legends appeared and spread among the people, preparing the way for the more original activity of the following century.

Gothic Period.—The extinction of the line of the Přemyslids (1306) marked the beginning of the so-called Gothic period in Czech literature which lasted approximately a century, until the age of John Huss (Jan Hus). The Gothic period was less specifically religious than the earlier age, and the objects of its interest were more frequently social and political in intent. The legends of Alexander the Great, so popular in the rest of Europe, reached Bohemia late in the 13th century and appeared in a Czech translation about 1310. The *Chronicle of the so-called Dalimil*, a rhymed history of the Czech and Moravian people, composed about 1325, was strongly nationalistic in tone, and bitterly criticized the Přemyslid kings for favoring German immigration, marrying German princesses, and accused the dynasty of conniving at the Germanization of the whole kingdom. There were other vernacular rhymed chronicles, some of which were based on German and French models, and the fashion for the octosyllabic couplet extended to lives of Christ and the apostles. But Latin culture was so widespread in the land that it was natural that much literature that was strongly nationalistic in theme and tone was written in Latin. On the other hand Latin liturgical drama made its appearance in Czech translations early in the 14th century. There was an increasingly close connection between vernacular and Latin literary expression during this period, but at the court of the King-Emperor Charles IV (1347-1378) the three liter-

atures, Latin, Czech and German, met on even terms, with profound effects upon all three. At Charles' suggestion, the chronicler, Pulkava translated his own chronicle from Latin into Czech, and then supervised its translation into German. The emperor's own Latin autobiography was also translated into Czech. A Czech translation of the Bible was completed in the later years of Charles, and his daughter Anna was reputed to have taken with her a copy of the Czech translation when she went to England to become the bride of the young Richard II.

Through this treatment the native tongue gained greater flexibility, and its vocabulary was substantially expanded. Thomas of Štítné (1331-1401) endeavored with signal success to show that the lowly vernacular was capable of expressing the high thoughts that had hitherto been universally reserved to Latin. His *Besední řeči* (*Learned Discourses*) treated with eloquence and clarity the most abstract concepts of theology and philosophy. But the vernacular was at the same time proving itself capable of being used in many other ways. Church and secular drama was presented to the people in Czech, and satire was not unknown. A scholarly Czech noble, Smil Flaška (1349-1403) of Pardubice (Pardubitz) composed *Rada otce synovi* (*A Father's Advice to his Son*) in 665 verses, and *Nova Rada* (*A New Council*) perhaps modeled on Chaucer's *Parlement of Foules*. This satire on politicians and prelates, though lacking in literary finish, is written with much humor and no little originality. The king and his advisers fare rather badly among the animals who make up the council.

John Huss and the Reformation Period.—The heroic figure of John Huss (c.1369-1415) dominates early Czech and Slovak spiritual and intellectual history. He sensed deeply the close connection between language and national feeling, and gladly preached to the common people in their own tongue. He left numerous letters and pamphlets on burning theological questions in Czech, which were copied and recopied by his followers, and a popular *Postilla* or collection of homilies. His own zeal and eloquence, and finally his martyrdom gave all these works of his added repute. Their effect upon Czech prose of the following centuries could not possibly be exaggerated. He revised the orthography of the language so wisely that modern Czech orthography is essentially his work; he encouraged the singing and composition of hymns in the vernacular, and may have participated in the revision of the Czech Bible.

Throughout the century the Czech language found itself capable of every kind of expression: chronicle, poetry, essay, philosophical and theological discussion, and the drama. Though it owed much to Latin and a good deal, though certainly less, to German—then a conscious and vigorous medium—Czech literary expression was going its own way with its own themes, its own values and its own spirit.

The 15th century, from the time of Huss to the Battle of Mohács (1526), is a period of strong anti-Germanism. The Czech language becomes an article of national faith, and German language and literature, because associated with those whom the Czech people hated and had to fight, were scorned and eschewed. This inevitably led to a certain isolation of the Czech people from the currents of thought and expression in the rest of Europe. This isolation is reflected in

their literature. It lost some of the breadth of approach and universality of interest it had showed in the previous period. But while something of breadth and cosmopolitanism was lost by this isolation, it may be that a distinctly Czech contribution to the literature of the world was thus enabled to come to fruition. It should be pointed out that during this century, though Slovakia was a part of the kingdom of Hungary the literary language of the Slavs of Slovakia was Czech, and that Hussitism and its literature were the property of the people. Hussite hymns and the Hussite Bible were widely used.

Heir of Huss, Petr Chelčický (c.1390-1460) was in turn the spiritual father of the Unity of the Brethren ("Jednota Bratří" or "Unitas Fratrum Bohemorum"). He was a thoroughgoing pacifist, opposed to social and ecclesiastical distinctions of all sorts, and passively opposed to civil government. Of his voluminous and unsystematic writing in Czech the *Siet' Viery* (*The Net of Faith*) written in 1340, is the best known. In it he sharply criticized the corruption and moral decadence into which organized Christianity had fallen, and appealed for a return to a simple trust in the efficacy of God's guidance. His largest work was his *Postilla*, composed c.1437, a commentary on the Sunday gospels. This work was the most popular among his followers. Czech tradition has come to regard Chelčický's thinking as typical of the best in Czech thought, and such a judgment is not difficult to understand.

During the remainder of the period before the Lutheran reformation, classical humanism became a prominent element in Czech and Slovak intellectual life. Native students had wandered to foreign universities and they brought back a consuming love for the Latin and Greek classics. Many of these were translated into Czech. Enea Sylvio Piccolomini (1405-1464), later Pope Pius II, a noted humanist, had spent some years, (1451 and after) at Prague as an imperial secretary, and had thus spread humanistic influences which he maintained by correspondence after leaving the country. His *Historia Bohemorum* was unfavorable to the Hussite movement, but it was translated into Czech in 1487. The first book printed in Bohemia or Slovakia was a Czech translation of the *Bellum Troianum* (Plzeň 1468). The New Testament in Czech was first printed in 1475, and the whole Bible in 1488. Before 1500 there was much printing in Czech and very little in Latin within Bohemia.

The Latinity of Czech humanism was good, but the spirit behind the prose was quite different from that of both Italian and German humanism. The two leading representatives of Czech humanism, Bohuslav of Lobkovice (1460-1510) and Viktorin Cornelius of Všehrad (1460-1520), illustrate the divergent tendencies of cultured thought at this stage. Bohuslav, of a Utraquist family, studied in Italy and became a fervent Roman Catholic. Returning to Bohemia, he entertained political ambitions which were generally frustrated. He wrote exclusively in Latin, and expressed open contempt for the vernacular. Všehrad, though as competent in Latin and as conversant with humanism as Lobkovice, remained loyal to Utraquism and the native tongue, translating Latin and Greek patristic writings into Czech. Perhaps as important as his translations was his *Nine Books on the Laws of the Czech Land* (1499), a scholarly study of

the ancient laws of the kingdom. Its importance was immeasurably enhanced by the sad fact that a fire in 1541 destroyed most of the ancient codices containing the laws he had studied, extracted and codified. His classical learning served to enrich the native culture. In this course he had perhaps more followers than Lobkovice (e.g. Rehoř Hrubý z Jelení or Gelenus, d. 1512, his son Sigismund, d. 1554, and Václav Hladíč of Písecký, d. 1511). Czech humanism took on a clearly Christian and patriotic cast which it was to maintain through much of the following century. On the other hand the extensive travel undertaken by young Czech students to German, Swiss and Italian universities at the end of the 15th century and in the early decades of the 16th was to have a profound effect upon cultural and literary patterns and concepts in Bohemia, and indeed in Slovakia as well, whence many students came to Prague to study. All the currents of Western thought and expression met and crossed in Bohemia.

Historical and Theological Writings.—The following generation had two main literary interests: history and theological controversy. The appeal to history gave rise to many chronicles, some in Latin and not a few in Czech. The best known, if at the same time the least reliable of these historical works was the *Czech Chronicles* of Václav Hájek of Libočany (c.1495–1553). Published in 1541, it gained immediate popularity. It was entertainingly written, but much of the history was very imaginary and not infrequently little better than fairy tales. Many of these tales have been widely accepted as late as the latter part of the 19th century. A much superior writer was the Moravian, Jan Blahoslav (1523–1571) bishop of the "Unitas." Equipped with the best humanistic training, he wrote a scrupulous and accurate history *Of the Origins of the Unity* (1547). He also wrote on political theory, music, a Czech grammar, and translated anew the New Testament. He may also be considered the first Czech literary critic.

The remainder of the 16th century saw much theological polemic and travel literature, some political verse, and a considerable body of hymnody, but little that was of permanent literary value until Jan Amos Komenský (in Latin Comenius, 1592–1670), the last bishop of the "Unitas." Most of his mature life, i.e., 1628–1670, was spent in exile, because of the expulsion of the Unitas from Bohemia by the Hapsburgs. As a consequence a great deal of his literary activity belongs as much to the whole of Europe as to his native land. But his spirit was so truly Czech that his Europeanism only emphasizes his Bohemianism. Philologist, scientist, theologian, mystic, educational innovator and reformer, he wrote more in Latin than in Czech, but the youthful Czech *Labyrinth of the World* (1623), though in the main pessimistic, remains one of the most powerful allegories in all literature, and has since been read by the Czechs and Slovaks almost as faithfully as the Bible.

Decline Under Hapsburgs.—The decisive victory of the Hapsburgs over the Bohemian nobility at the Battle of the White Mountain (Nov. 8, 1620) had disastrous results for every phase of Czech, and in no less a degree Slovak, literary activity. By this time the connection between Bohemia-Moravia and Slovakia was again close. Hussitism, Lutheranism, and Calvinistic Protestantism had gained many adherents in Slovakia,

and many Slovaks had come to Prague to study, later to return to their homeland with new books in their bags and new ideas in their minds. The early Jesuits in all three lands were not sympathetic towards a language and a literature which had so long been media for the spread of heretical doctrines, and permitted only the most jejune devotional works to be printed in the vernacular. There was, however, one notable exception. A Czech Jesuit, Bohuslav Balbín (1651–1688) was patriotically minded, and wrote—in Latin—a *Dissertatio apologetica linguae slavonicae* and an *Epitome rerum bohemicarum*. But no revival of the vernacular resulted from this isolated effort.

The native language virtually ceased to be written. It came to be regarded as the language of the peasant and the servant classes. The nobility, the clergy, and the bourgeoisie wrote almost exclusively in German or Latin, though there is no doubt that Czech continued to be spoken in a large number of homes. Recent studies of this otherwise fruitless period have emphasized the fact that some of the native clergy wrote religious verse which represents the baroque spirit at its best. In Slovakia, where Habsburg rule was less able to work its will, the vernacular was more read and spoken than in Bohemia. The population of Slovakia yielded to the missionary zeal of the Jesuits less rapidly than in Bohemia, yet literary decline was no less certain, and by the second half of the 18th century a vernacular literary tradition had virtually ceased to exist. It may be suggested that the very fact that there was no cultured literary expression in the vernacular certainly served to make the peasant and working classes treasure their language the more; and the novel, the poetry, and the drama of later centuries were to profit richly from the folk character of recurrent motifs embedded in the minds of an oppressed peasantry.

The Nineteenth Century.—It was from this nadir that the native languages and literatures made a remarkable recovery. Within the space of a single generation scholars, poets, and publicists were enthusiastically using the hitherto scorned vernacular and finding it to be supple, adaptable, expressive, and responsive to their national feelings. The earliest leaders of this Czech and Slovak renaissance were philologists, grammarians, and political and cultural historians, e.g., Josef Dobrovský (1753–1829), Josef Jakob Jungmann (1773–1847), Josef Šafařík, a Slovak (1795–1861), and František Palacký (1798–1876). The romanticism of Rousseau and Herder (qq.v.) was too vital not to spread among the western Slavs and spring forth in poetry. A Slovak, Ján Kollár (1793–1852), deeply influenced by Herder's airy concept of the primitive Slav, composed (1824) a collection of sonnets entitled, *Slávy Dcera* (*The Daughter of Sláva*), which constituted a burning apostrophe to his whole Slav race. It was immediately and immensely popular. Some years later (1837) he wrote, first in German, a short treatise *Ueber die literarische Wechselseitigkeit zwischen der verschiedenen Stämmen und Mundarten der slawischen Nationen*, which might be freely translated as *Concerning the Characteristics Common to the Different Peoples and Dialects of the Slavic Nations*. This work, pleading for literary Pan-slavism, was popular in his lifetime, but the development of the people did not appear to lie in that direction.

CZECHOSLOVAK LITERATURE

The 19th century witnessed great and fruitful literary activity in all fields of literature. František L. Čelakovský (1799–1852) was a prolific and talented romantic poet whose sympathetic treatment of the native spirit in both epic and lyric made him the leader of a numerous school. Karel Hynek Mácha (1810–1836), influenced by the Polish romanticism of Adam Mickiewicz (q.v.) was probably the most extreme and in some ways the most significant of the Czech romantic poets. His verse is rich in thought and the undertones of a sincere if desperate search for an understanding of the mystery of nature and life. Pervid and romantic patriotism did not bring political or cultural liberty, as the events of 1848 were to show, and a period of disillusionment set in. The clearest voice of this reaction, which may be called the early phase of realism, was that of the brilliant journalist, Karel Havlíček-Borovský (1821–1856) (see HAVLÍČEK, KAREL). His forte was political satire, but he wrote much folk poetry, e.g. *Tyrolese Elegies* (1853), in the style of the romantics, though even here his satiric temperament found occasional expression. But satire is rich fare, and the people can stand only so much of it before a reaction to a gentler pabulum sets in. After Havlíček, came the much less disturbing folk novel.

The most popular folk story among the Czech people is *Babička* (*Grandmother*) by Božena Němcová (1820–1862, q.v.), the first Czech woman to achieve literary eminence. It is a *roman de mœurs* of the purest sort, depicting the family life, sorrows, and joys of a Czech mountain village. The popularity of this genre was reflected in the great number of authors who followed the lead of Němcová, and the folk novel was assiduously cultivated during the rest of the century. There was, however, a growing tendency to enrich the native themes by drawing on the literary achievements of the rest of Europe. Vítězslav Hálek (1835–1874) was the leader of a whole generation of writers who read Heine, Byron, Bret Harte, Turgenev and Shakespeare. It could not be expected that such diverse models could be harmonized, but urbanity and harmony were less important to these writers than vigor of expression or breath of experience.

Rise of Realism.—In the meantime Slovakia had produced a school of political and artistic realists. The same currents of the romantic liberalism of Herder and Rousseau had spread among the Slovak intelligentsia as among the Czechs. Many Slovak youth had attended German universities, and by the 1840's the early illusions of romanticism had worn off, and a grim and positive realism was left. The leaders of this Slovak realism were Ľudovít Stúr (1815–1856) and Josef Miloslav Hurban (1817–1888). There were many poets and publicists to follow their lead. Politics and letters were inseparable in Slovakia, as in Bohemia. The poetry produced was patriotic and hopeful, which meant separatism from Magyar rule. One result of this movement was the standardization of the dialect of central Slovakia, and a literary and linguistic independence of Czech leadership.

The greatest name in Czech literature of the 19th century is undoubtedly Jaroslav Vrchlický, whose real name was Emil Frida (1853–1912, q.v.). His production was prodigious: well over 150 volumes of poetry, dramatic compositions, novels and short stories, literary criticism, and

translations from many languages. His education was European-wide; his gift was sensitive lyricism; his model, Victor Hugo. But his genius was not bound by these limits; he learned from Dante, Tasso, Goethe, from Carducci, Camões, Whitman and Poe. His favorite medium was the epic and the historical theme. The universality of Vrchlický's gifts overshadowed some very important work. The less copious poetry of Jan Neruda (1834–1891) has appeared to many critics to be more genuinely the work of a poetic genius than that of Vrchlický. Most of his literary activity, however, was in journalism as the leading *feuilletonist* of Prague, where his influence on the younger generation of writers was great.

One of Vrchlický's contemporaries, Svatopluk Čech (1846–1908, q.v.), may not have exercised as great an influence on Czechoslovak letters; but he was more popular among the people, largely because of his strongly nationalistic cast of thought, his willingness to bring his gifts down into the arena of social and political action as a literary spokesman for the Young Czechs, and his fruitful use of historical themes in his epics, short stories, and dramas. From an artistic point of view, his ripest work was the *Václav z Mihalovic* (1882), a story of the 17th century in Bohemia when the Czech people had just fallen under the heel of the Habsburgs.

It was no accident that the leaders of the national revival of the early 19th century were historians or historians of literature. Not only did the patriotic poets and dramatists who followed use historical themes, but the novelists as well. The compendious historical works of František Palacký (1798–1876), Zikmund Winter (1846–1912), Josef Kalousek (1838–1913), T. V. Bílek (1819–1903) and Václav V. Tomek (1818–1905) were carefully read and absorbed. Of these scholars, Winter wrote an historical novel *Mistr Kampanus* which is a model of its kind. Alois Jirásek (1851–1930), the leading novelist of preindependence Bohemia, chose almost all his plots from the history of his country. He took great care to obtain complete accuracy in detail, not only in political history, but in customs, dress and social patterns. Structurally and stylistically his work lacked finish, but his patriotic fervor easily accounted for his popularity.

The opening of the National Theater in Prague in 1883 was a great stimulus to the Czech drama, and the results were not long in becoming apparent. A revival in creative music, led by Bedřich Smetana (1824–1884), coincided with the heightened dramatic production and the popular appreciation of the potentialities of the stage.

In 1867 Magyarization among the Slovaks became more severe than before. The Slovak reaction was unmistakable, and their literature took on a more determined and confident tone. Hviezdoslav (Pavol Országh, 1849–1921) was Slovakia's greatest poet, whose lyrics and epics reflect the ardent patriotism of the Slovak peasantry. Hviezdoslav also did much to raise the level of cultural literacy by translating many English, German, and Polish classics into Slovak. Svetozar Hurban-Vajanský (1847–1916) was also influential among Slovaks through his patriotic and frequently Pan-Slavic poetry and prose. Martin Kukučín (1860–1928), a doctor of medicine whose real name was Matej Bencúr, spent most of his mature life in Dalmatia and in South America, but he continued to write appealing

stories of Slovak peasant life and some longer novels on social themes. He may be regarded as one of the most effective Slovak writers in prose, and as a refreshing realist by contrast to the romanticism of the preceding generation.

Literary Criticism.—In Bohemia, in the decades preceding independence, two significant movements gained headway. Literary criticism, led by F. X. Šalda (1867–1937), became an established literary genre destined to make Czech and Slovak literature in general an extremely conscious medium and the political and philosophical thought of Tomáš Garrigue Masaryk (1850–1937), under the banner of realism, became the touchstone and inspiration of the whole younger generation of the intelligentsia and political reformers.

Twentieth Century Writers.—The war years, 1914–1918, were devastating for Czech and Slovak letters. Strict Hapsburg censorship and persecution, and prison for a number of patriotic Czech and Slovak writers, dried up the wells of creative writing. With independence and the union of the two sister peoples in one political organism, a new and fruitful period set in. Political and social problems took the place of the romanticism of prewar days; English, American, Spanish, and French authors were translated and widely read; and a feverish desire was everywhere evident to catch up with the currents of literary movement in the rest of the Western world. Many poets and novelists of prewar days now found themselves isolated and almost totally forgotten.

Poetry was the medium most sensitive to the new political conditions, and the first few years after liberation witnessed an outpouring of "proletarian" verse. The guiding light of this radical group was Jiří Wolker (1900–1924) whose early death marked the end of this period, to be followed by a reaction toward a less dynamic and more imaginary poetry. Around 1930 a more serious—even melancholy—turn may be noticed, again a reflection of the distressing effects of the worldwide depression and the rise of aggressive nationalism in Germany.

The post-1918 novel was subject to the same currents of thought, but was perhaps less deeply disturbed by them. Interest in larger social problems became paramount. The peasantry again served as the focus of the novelist's attention, but no longer in the tradition of folklore and condescension, but now as a living social problem, a part of the whole question of the nation's adjustment to an age of rapid social and economic transition. The novel has been a popular medium, and the period of the first republic produced many capable novelists: Jaroslav Hašek (1883–1923), whose *Good Soldier Švejk* so pointedly ridiculed Austrian militarism; Ivan Olbracht (1882–1939), whose best work was *Nikola Šuhaj*, a sort of Robin Hood of Ruthenia; Jaroslav Durych (1886–), who gave new life to the historical novel along Roman Catholic lines; Vladislav Vančura (1891–1939), who sought the unusual and the grotesque but with competent mastery of language and structure; and Karel Čapek (1890–1938), the most versatile genius of modern Czech letters. He was at the same time international and philosophic, and behind the simplicity and charm of his style the complete accordance of his ideals with the highest in Czech spiritual life becomes manifest.

The drama in these two decades has not had

a corresponding solid vitality. There was much experimentation, much attention paid to stage-settings and effects; but the drama as literature did not prove to be equal to poetry or the novel as a means of presenting clear ideas to an age seeking solutions of social and cultural questions.

Czechoslovak literature in the homeland after March 1939, under German control, was no longer free. There was some publication in Czech and Slovak, but it was completely lifeless. Czechs and Slovaks who escaped to France, Great Britain, Soviet Russia and the United States courageously continued their cultural life, founding newspapers and reviews, and publishing new books as well as reprinting classics. It is not yet possible to assess the value of these five years of enforced exile on many literary leaders, but there can be no doubt that the intimate contact of more Czechoslovaks than at any other time in their history with the other Western cultures, will have a profound effect upon all forms of literary expression in a Czechoslovakia that is again free.

S. HARRISON THOMSON,

Professor of History, University of Colorado

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CZECHOSLOVAK MUSIC. Rise of Czech Popular Music.—The earliest forms of Czech music extant are religious folk songs. The coronation song of Czech kings, *Hospodine, pomiluj ny, . . .* (Lord, have mercy upon us), dating from the 12th century, betrays Byzantine influence, since it was from Byzantium that Christianity came to the Czechoslovak lands. Roman and Western influences later prevailed; but in spite of the propagation of Latin chorals, the original folk songs in the native tongue live on, even in the churches. The single-voice church lays, originating in the Gregorian choral, appeared in many forms; the religious mind of the population and an innate musicality brought many religious folk songs into being, with all their significance for a nation whose liberty was constantly threatened. The imploring song *Saint Wenceslaus (Svatý Václav)*, dating from the Brandenburgian occupation (approximately 1280), is one such document. These songs are all simple, their melodies moving in small intervals, and all are imbued with deep faith and devotion.

Medieval secular music as cultivated at the royal courts of Czech kings was subject to the strong influence of the German minstrels. From 1310 on, under the auspices of the Luxemburg dynasty, French influence of the *Ars nova* (Guil-

laume de Machaut, 1305?-1377) began to gain ground, favoring preservation of the popular touch. In this period we encounter the name of the first Czech composer of Czech lay songs, Závíš (Záviš, c. 1360-), master of the University of Prague. His *leichs* (songs) do not bear comparison with similar contemporary compositions from western Europe. The so-called "Rorate" songs (morning Mass songs) also originated at this time, mainly as popular versions of Gregorian chorals. The 14th century also brought forth the first paschal plays and popular plays with music (*Mastíčkár*, *The Quack*).

Throughout the period of the Hussite wars for religious and national liberty (first half of the 15th century), when the polyphonic style was rising to dominance in western Europe, the monodic folk songs persisted in Czechoslovak music as a symbol of liberty and as an expression of powerful musical conviction. The most famous of these devout yet warlike and polemic songs (most of them in the Phrygian mode) is the battle hymn *Ktož jsú boží bojovníci*, (*O, you warriors of the Lord God*). In the struggles with the Germans this hymn acquired historical importance and inspired a series of later compositions. Religious and lay songs of Hussite origin, collected in numerous *cancionals* (song-books) and fostered by the so-called "literati" brotherhoods, exerted a considerable influence upon the life and musical education of the Czechoslovaks and upon the form and spirit of Protestant religious songs in Germany.

Polyphonic music (of the Dutch school) finally penetrated into the *cancionals* about the end of the 15th century, just as it did into the programs of the court bands of Czech kings and of the orchestras of some of the noblemen. In the 16th century we find a considerable number of representatives of this style, notably: Jan Trojan (Trajanus, Turnovský), Jiří Rychnovský (?-1616), and Kryštof Harant z Polžic (1564-1621), who most of all approached the world standard of his time. Many of these composers based their songs on folk melodies. Among the composers of the *cancionals* used by the Czech Brethren, Jan Blahoslav (1523-1571) achieved prominence through editing as early as 1560 *Musica*, the first theoretical treatise on music, embodying a very progressive conception. In the days of Rudolf II (1576-1612), Prague became a center of European musical life. The king's orchestra included Philippe de Monte (de Mons, 1521-1603), Carl Luyton (?-1620), Jacob Regnart (c. 1540-1599), Jacobus Gallus (Jacob Handl, 1550-1591) and other famous musicians.

The 17th and 18th Centuries.—This promising development was interrupted by the Thirty Years War (1618-1648). Yet despite the Catholic counterrevolution, music in the Hussite tradition, read from adapted texts, continued to resound in the towns and villages. Elements of the native music along with imported elements of Jesuit origin were perpetuated in the *cancionals* published in 1647 and 1661 by Adam Michna z Otradovic, in 1683 by Matěj Václav Steyr (Styr, Steyer, 1630-1692), and in 1697 by Václav Karel Holan Rovenský (1644-1718). Instrumental music of the baroque style found its way into the churches. Largely through the influence of the *Cythara Sanctorum* (1636) of Jiří Třanovský (Tranoscius, 1591-1637), the purity

of the indigenous tradition in religious singing was kept alive in Slovakia longer than in Bohemia.

Two outstanding composers appeared at the end of the 17th century: Jan Dismas Zelenka (1679-1745), a pupil of Johann Josef Fux (1600-1741), who became a prolific composer of religious and secular music which even won the appreciation of Johann Sebastian Bach (1685-1750, q.v.); and Bohuslav Černohorský (Černohorsky, 1684-1742), teacher of both Christoph Willibald Gluck (1714-1787, q.v.) and Giuseppe Tartini (1692-1770). Černohorský falls short of Bach's wealth of polyphony. Yet the melodic and harmonic features of his compositions make him a significant forerunner of Viennese classicism. His pupils and followers—Jan (Johann Anton) Zach (1699-1773), František (Franz) Tuma (1704-1774), Josef Seger (Segert, Seegr, 1716-1782), František (Franz) Habermann (1706-1783), František (Franz Xavier) Brixl (1732-1771), and Johann Anton Koželuh (1738-1814) already form a transition from the baroque to the classical.

Czech musicians, active in court orchestras all over Europe, contributed even more significantly to the emergence of a new trend in secular music. Among them were Georg Benda (1722-1795, q.v.), composer of light operas and of the scenic melodrama *Ariadne at Naxos*, who worked in Gotha; Jan Václav (Johann Wenzel) Stamitz (1717-1761), founder of the Mannheim school, and chief protagonist of the sonata form and the new symphonic style; Josef Mysliveček (Il Boemo or Venatorini, 1737-1781), composer of many operas and symphonies; Leopold Koželuh (1752-1818), Jan Ladislav Dusík (Dussek, 1761-1812, q.v.), a brilliant pianist and prolific composer of sonatas and piano concertos; Jan Vaňhal (Wanhal, 1739-1813); Vojtěch Jírovec (Adalbert Gyrowetz, 1763-1850), court conductor in Vienna; and Antonín Josef Rejcha (Reicha, 1770-1836, q.v.), a distinguished theorist, tutor to a whole generation of French composers. These were only the most notable of the many Czechoslovak musicians, who as performing artists or composers made their influence felt throughout Europe in the 18th century. Antonín Filip Heinrich (1781-1861) went to the United States in 1818 and was the first composer to base large-scale orchestral and choral works on native American themes. Czech musicians, particularly Benda, Stamitz, and Mysliveček, with their high technical and formal standards, played a great part in fertilizing the evolution of European classical music, and along with the exponents of Italian opera, in Prague, prepared the way for the music of Wolfgang Amadeus Mozart (1756-1791, q.v.), who in 1787 was enthusiastically hailed in Prague, and thereafter widely imitated. From these Czech pioneers of classicism onwards to such early timorous romantics as Václav Jan Tomášek (Tomaschek, 1774-1850) and his pupil Jan Hugo Voříšek (Worzischek, 1791-1825) who inspired Franz Schubert (1797-1828, q.v.) by their piano compositions, many Czechoslovak musicians achieved more than merely local interest.

Emergence of Czech National School.—A group of composers now emerged who deliberately created the Czech romantic song in the popular vein. František Škroup (1801-1862), conductor of the Prague opera, composed the Czech anthem and the first Czech opera *Drá-*

tink (*The Tinker*) in 1826. Jan Bedřich Kittl (1809–1868), director of the Prague Conservatory of Music, and others moved by the current of national consciousness, endeavored to evolve an independent national school in the spirit of the new music of the people. The first theorist of this movement, the composer and musicologist Josef Leopold Zvonar (1824–1865), showed how modern trends of Czech music could unfold themselves through peculiarities of melody, rhythm, and harmony. The diverse aims of these creators of the national school were not fully resolved until Bedřich Smetana (1824–1884, q.v.), the creator-genius, assumed the task of combining innate musicianship, melodic tenderness, and rhythmical diversity with musical conceptions of monumental proportions. Smetana is rightly considered the true founder of Czech modern music. In all the major fields of music he envolved works which signalized a new era. He first achieved high distinction as a piano performer of programmatic and dance works, and as the composer of piano and chamber music. His most notable contributions were in the field of the symphonic poem—particularly in the production of his monumental six-part cycle *Má Vlast* (*My Country*), glorifying the past and future of his motherland—and in that of the opera. Of his eight operas *The Bartered Bride*, while it is the most popular, falls short of his comic operas *Huňáček* (*The Kiss*) and *Tajemství* (*The Secret*) in stylistic maturity and lyrical ardor. *Dalibor* and *Libuše* excel in dramatic expressiveness and patriotic passion.

Smetana's era was marked by a great surge forward of Czech musical life—by the founding of general musical and singing societies, by regular orchestral concerts, by visits to Prague of many celebrated musicians from other countries, by the founding of the National Theater, and by a great increase in the number and volume of musical publications.

Smetana, consciously devoted himself to the service of the national art of his people, and became one of their spiritual leaders. Around him arose a galaxy of younger composers, most of them pupils of the Prague Conservatory. Of these, Antonín Dvořák (1841–1904, q.v.) alone attained world fame. While Smetana knowingly pursued his chosen style and program, Dvořák was a typical, popular, inexhaustible musician, drawing the elements of his creations out of the rich well of musical thought, mainly in the romantic pattern of symphonies and chamber music. His tunefulness and cheerfulness, his placidity and humility, find their expression in countless compositions, soaring spontaneously; his favorite forms were the sonata and the great cantata; but his merit is equally apparent in his songs (Biblical songs and gypsy songs) and in his operas. His nine symphonies and 12 quartets with their impulsive ardor are the paramount gifts of the Czech national school to world art. Dvořák's activities in New York (1892–1895) had their outcome in the development of fertile motives in his works composed in the United States (the symphony, *From the New World*, two string quartets, the Cello Concerto, the Violin Sonata, and other works), demonstrating how the exotic tunes and rhythms of Negro songs can inspire a Czech musician without depriving him of the emotional ties of the homeland. His balladic symphonic poems and eight operas, especially *Jakobín* (*The Jacobin*), *Dimotrij*, and

Rusalka (*The Water Nymph*), are still insufficiently esteemed as proofs of his versatile genius.

Zdeněk Fibich (1850–1900, q.v.) was long considered in Czechoslovakia equal in stature to Smetana and Dvořák. Fibich was a romantic of the type of Robert Schumann (1810–1856, q.v.), who drew his best material from his own consciousness, unfolding it in countless intimate piano compositions, symphonies and symphonic poems. His operas, *Nevěsta Messinská* (*The Bride of Messina*), *Šárka, Pád Arkuna*, (*The Fall of Arkona*), were patterned on the strict music drama. But this pattern was further evolved in his remarkable melodrama *Hypodamia*, an antique trilogy worked out on motivistic principles.

The development of Jan Levoslav Bella (1843–1936), the Slovakian composer, was parallel to that of Fibich, although his compositions were less personal; he moved in the footsteps of Smetana and Wagner. In numerous religious works, in an opera, *Kovář Wicland* (*Wyland, the Smith*), and in a symphonic poem, *Osud a ideál* (*Fate and Ideal*) he also paid homage to neo-romanticism.

A transition figure between the founders of Czechoslovak music and its great contemporary exponents is Josef Bohuslav Foerster (1859–), the Nestor of Czechoslovak composers. In the symphony he continues in the established tradition, but in some of his operas, particularly *Eva* (1897), and *Jessica* (1905), he has created a new style—a noble lyrical and psychological drama—while in his choirs he already marks the way to an entirely novel idiom in which expressive recital is effectively united with well-chosen melodies. In choir compositions, the 20th century Czechoslovak composers, following the happy example of Pavel Křížkovský (1820–1885) and of Karel Bendl (1838–1897), have an abundant and impressive record.

One of the most original, if not revolutionary, phenomena of the bygone generation was the Moravian, Leoš Janáček (1854–1928). At the outset he was a follower of Dvořák; his close studies of the folk song subsequently led him to adopt a more realistic mode. The spontaneous, although belated, success of his opera, *Její pastorkyňa* (*Jenufa*, 1916), at once put him in the first rank. He is not given to romantic idealization; his expression surges out of the depths of a passionate temperament, out of pity and deep absorption in the soul and speech of the people. He is opposed to any rigid technical or formalistic convention. His music is irascible, direct, explosive. His fragmentary melodies are like echoes from inbound waves of sentiment. Apart from *Jenufa*, the peak of his emotional dramatism was reached in the operas, *Kaťa Kabanová* (1919), *Liška Bystrouška* (*The Sly Vixen*, 1923), and *Z mrtvého domu* (*From the Dead House*, 1928). His chamber music and his choral compositions, the symphonic poem, *Taras Bulba* (1918), the *Symfonieta* (1926), and *Glagolská Mše* (*The Glagolitic Mass*, 1927) all show his folkish originality and youthful strength.

The 20th Century.—Among Dvořák's pupils, Vítězslav Novák (1870–) takes a leading place together with Josef Suk (1874–1935). Although both of them derive very much from their teacher, and from Johannes Brahms (1833–1897, q.v.), both, in his own way, enriched harmonic and melodic expression, and the two grew into individualities of quite distinct character.

Novák's music was inspired for years by the tonal and rhythmic elements of popular tunes surviving in eastern Moravia and Slovakia (*Slovakian Suite, In the Tatra*). Novák is also a reformer of harmony, of motivic development and architectonic conception. He combines a touch of passionate sensuality with an irony, which at a time averse to impressionism made him a leader of the new generation. The crux of his work lies in his orchestral compositions and cantatas: *O věčné touze* (*On Eternal Longing*), *Bouře* (*The Tempest*), *Pan, Autumn Symphony*, *South Bohemian Suite*; but his vocal and chamber music surge in a new direction.

The work of Josef Suk had a happily inspired beginning. He later became more subtle, achieving much subjective intensity and tonal colorfulness. The death of Dvořák and of Dvořák's daughter (Suk's wife) steered his music into new, serious channels and gave it tragic content. A great symphonic cycle comprising *Asrael* (1906) *Pohádka léta* (*A Summer Tale*, 1908), *Zrání* (*The Ripening*, 1917), and *Epilog* (1932) do not merely signify the revelation of a personal and common human fate; they also mark a further conquest in Czech creativeness which, in spite of the alluring temptations of impressionism and colorism, clung to its own melodic character and rhythm.

Fibich's pupil, Otakar Ostrčil (1879-1935), by dint of his inner logical evolution and sense of music structure, moved in his later works from Mahlerian romanticism (the style characteristic of Gustav Mahler, Bohemian conductor and composer, 1860-1911) to linear polyphony. His endeavors perhaps surpass his creative but rather reflective potentialities. He was none the less a figure of outstanding importance as chief conductor of the Prague National Theater (following the excellent musician and opera composer, Karel Kovařovic, 1862-1920) and as composer of the operas, *Poupě* (*The Bud*, 1910), *Honzovo království* (*Johnny's Kingdom*, 1933), the orchestral *Impromptu* (1911), and the symphonic variations, *Křížová cesta* (*Calvary*, 1928), all noteworthy on account of their bold structural conceptions.

Novák, Suk, and Janáček have been the chief models and teachers of the 20th century composers—a generation which preserves its versatile character, while French impressionism dies quietly away, and music in general goes through the era of more intellectual constructivism. Otakar Zich (1879-1934) is a composer of formalized conversational operas. Rudolf Karel (1880-1945), the last pupil of Dvořák, is a transitory type between romanticism and a new polyphonic style. Jaroslav Křižka (1882-) finds his blissful expression in witty choral compositions and in children's songs. Ladislav Vycpálek (1882-) writes austere, deeply conceived cantatas, *O posledních věcech člověka* (*On the Last Things of Men*) and *Blahoslavený ten člověk* (*Blessed the Man*). Emil Axman (1887-) unites in his symphonies traditionalism and Moravian fervor with virile force of expression. Boleslav Vomáčka (1887-), Novák's pupil, has found his most personal outlet in melodically conceived choral works and songs. Karel Boleslav Jirák (1891-) is an intellectual at the crossroads between romanticism and constructivism.

The most successful of the 20th century Czechoslovak composers abroad is Bohuslav Mar-

tinů (1890-), pupil of Suk and of Albert Roussel (French composer, 1869-1937), who after surmounting the influence of the French environment (having lived in Paris for many years) has developed into a distinguished and clearly purposeful personality whose extraordinary abundance, melodic and rhythmic versatility, and well-balanced sense of form and sound are controlled by a keen feeling for lucid construction.

The numerous generation of composers whose work falls in the 20th century is very much differentiated and complex. Issuing out of Novák's school or closely akin to it, are Jaroslav Novotný (1886-1918), Jaroslav Jeremiáš (1889-1919), Václav Kálík (1891-), Otakar Jeremiáš (1894-), František Pícha (1894-), Jaroslav Řídký (1897-), Jan Zelinka (1893-), Vladimír Polívka (1896-). Tendencies contrary to the last traces of romanticism are represented by: Alois Hába (1893-), the propagator of quarter-tone music and nonmelodic style; his brother, Karel Hába (1898-); Pavel Bořkovec (1894-), a consistent linearist; Iša Krejčí (1904-); František Bartoš (1905-), Emil František Burian (1904-), and Jaroslav Ježek (1906-1941), the popular creator of Czech jazz music, who died in New York, an emigrant.

In Brno, Moravia, around Janáček, and after him, a group of composers, conductors, and teachers developed which included Jan Kunc (1883-), Václav Kaprál (1889-), Vilém Petrželka (1889-), Vladimír Ambros (1891-), Jaroslav Kvapil (1892-), Osvald Chlubna (1893-), and Pavel Haas (1899-1944).

In Slovakia following 1918, when political independence began, after a period of folklore romanticism, a newly educated generation was maturing whose transitory conceptions were represented in Friso (Bedřich) Kafenda (1883-), while Eugen Suchoň (1908-) and Alexander Moyzes (1906-) were beginning to represent still later tendencies.

Organization of Czechoslovak Musical Life. From the middle of the 19th century, the organization of Czechoslovak musical life had considerably broadened. Many composers, teachers, and instrumentalists trained in the Prague Conservatory (established in 1811) found their way to other countries. This conservatory was taken over by the state in 1920 and another established in Brno, with Janáček as its chief adornment. Studies in the history of music and musicology achieved commanding importance—at the University of Prague under Otakar Hostinský (1847-1910), and Zdeněk Nejedlý (1878-), at Brno under Vladimír Helfert (1886-1945), and at Bratislava under Dobroslav Orel (1870-1942).

The Czech Philharmonic, originally the orchestra of the National Theater, became an independent institution in 1901, and after 1919 gained world fame under the baton of Václav Talich (1883-) and Rafael Kubelík (1914-). The Hlahol (The Prague Choral Society), dating from 1861, and the choral societies of the Prague and Moravian teachers, attained a virtuosity of unprecedented perfection.

Choir singing and chamber music were fostered in Prague and other cities by numerous societies, and under the First Republic concert and operatic activities developed in Prague and elsewhere. A broadcasting corporation, the semi-official Radiojournal, cultivated serious music.

The German Occupation and After.—

During the German occupation of Czechoslovakia (1939–1945), popular interest in music did not die out, but was fostered as a stimulus and expression of patriotic feelings. Many musical scores and books about music were published. In liberated Czechoslovakia the established national musical tradition was carried forward with new intensity.

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JAN LOWENBACH,

Author of works on music and copyright law.

CZECHOSLOVAKIA, chĕk'ô-slô-va'ki-â

(Czech. ČESKOSLOVENSKO, chĕs'kô-slô'vĕn-skô), republic in the heart of central Europe which emerged an independent nation as a result of the World War of 1914–1918 and the collapse of the Austro-Hungarian Empire. The Czechoslovak National Council in Prague (Praha) proclaimed the establishment of a free and united Republic of Czechoslovakia on Oct. 28, 1918. Slovak membership in the new republic was reaffirmed in the declaration of the Slovak National Council at Turčianský Svätý Martin on Oct. 30, 1918. Sub-Carpathian Ruthenia came into the state as a result of similar action on the part of Ruthenian leaders on May 8, 1919.

At the time of the Munich agreement of Sept. 29, 1938, which was to lead to the destruction of the first Czechoslovak Republic in March 1939, the country had an area of some 54,244 square miles and an estimated population of 15,247,000. It comprised the four provinces of Bohemia (Čechy), Moravia-Silesia (Morava-Slezsko), Slovakia (Slovensko), and Carpathian Ruthenia (Podkarpatská Rus). In the west, north, and south, the boundaries of Czechoslovakia were essentially the historic frontiers of Bohemia and Moravia (qq.v.). In the south, Czechoslovakia was given a frontier on the Danube River. With the cession of Ruthenia to the Soviet Ukraine on June 29, 1945, the area of Czechoslovakia was reduced to 49,371 square miles, with an estimated population of 13,000,000. Prague (est. pop. 950,000) is the capital of Czechoslovakia. Other important cities, with populations estimated for 1950, are as follows: Brno (Brünn), 272,700; Moravská Ostrava, 181,000; Bratislava, 172,000; and Plzeň (Pilsen), 120,000. The currency system is based on the Czechoslovak koruna (Kč) or crown, the value of which was about two cents in 1951. The metric system of weights and measures is used. The Czechoslovak flag is divided equally into an upper horizontal band of white and a lower band of red, broken into by a blue triangle extending from the mast to the midpoint. The national anthem (see also NATIONAL HYMNS AND ANTHEMS) comprises a Czech portion called *Where Is My Native Land?* and a Slovak section entitled *It Storms Over the Tatras*, both played together as a single anthem.

Detailed discussion of Czechoslovakia is given under the following headings:

The Land	Government
The People	Education
Agriculture	Arts and Sciences
Industry	Religion
Commerce	History
Transportation and Communication	Bibliography

The Land. Historic Czechoslovakia occupies a position of great strategic significance in central and eastern Europe. There are two important mountain systems, the Carpathian Mountains in the eastern part of Moravia, and in Slovakia and Ruthenia, and the Sudeten Mountains in the west along the frontiers with Germany. While Bohemia and Moravia-Silesia are plain country surrounded generally by mountains, Slovakia and Ruthenia are dominated by mountainous areas. The principal rivers are the Elbe (Labe), the Vltava (Moldau), the Oder (Vodrá), the Morava (March), the Váh (Waag), and the Danube (Donau; Duna; Dunărea).

Both topography and climate tend to make Czechoslovakia one of the rich lands of Europe. Forests cover about one third of the land, conifers making up more than one half of the forested area. The mineral resources of the country include lignite, hard and soft coal, iron, graphite, silver, copper, lead, and rock salt. Mineral waters, which provide the bases for numerous health resorts, are another source of wealth. The world-famous radium mines at Jáchymov are state property, now evidently under Soviet exploitation. Clay soil (kaolin) furnishes raw material for the porcelain industry of the country. Rivers and streams supply a considerable amount of potential water power. Early in the history of the republic, work was begun on dams at Zimovice and Kruzkberk, near Opava (Troppau) and Krnov (Jägerndorf), to provide some 40,000 horsepower for the textile and metallurgical industries of that region and to supply water for the mines and iron works at Vítkovice (Witkowitz), Ostrava, and Bohumin in the Ostrava-Karvinná coal fields.

Czechoslovakia possesses a temperate climate distinguished by adequate rainfall and moderate temperatures, with topographical factors accounting for important climatic variations—particularly in the Carpathians and the Bohemian highland areas. With two thirds of the rainfall occurring in the spring and summer and little during the winter, precipitation is generally distributed advantageously for the raising of crops. Rainfall ranges from less than 23 inches in western Bohemia and southern Moravia to more than 50 inches in some sections of the Carpathians. The summers are generally mild in temperature, but the winters are usually long and cold. In Prague the average July temperature is approximately 67°F. and the January average is about 30°F.

The People.—For about 1,400 years the Czechs and Slovaks, kindred Slavic elements, have lived in the region known since 1918 as Czechoslovakia. During the interwar period, Czechs and Slovaks made up about 9,756,600 of the population, or about 66 per cent of the total, with the Germans constituting about 20 per cent and the Magyars almost 5 per cent of the population. With the transfer of a large portion of the German-speaking population and some of the Magyars, and with the cession of ethnically complex Ruthenia to the USSR, approximately nine

tenths of the people in 1951 were Czechs and Slovaks.

Agriculture.—During the period of 1918–1938 Czechoslovakia had a well-balanced economy. In 1938, 35 per cent of the population was engaged in agriculture and related occupations, 35 per cent in industry, 17 per cent in professional or public service, and about 7 per cent in commerce, banking, and credit. In 1951, about 35 per cent of the people continued to engage in agriculture. Approximately 42 per cent of the land is arable, 31 per cent is forest land, and 15 per cent is pasture. Wheat and barley are grown in the lowlands, rye and oats in the uplands, and corn is raised in the eastern part of the country. About 1 per cent of the arable land is devoted to industrial crops, the most important of which are hops, linseed, poppies, flax and hemp, and tobacco. Potatoes are another important crop, along with apples, pears, plums, grapes, peaches, apricots, and cherries. Dairying and raising of livestock are also very important agricultural industries. Some 3,500,000 head of cattle, 2,700,000 hogs, 500,000 sheep, and 1,000,000 goats were being raised in 1950.

During the interwar period, agriculture was organized on the basis of the great land-reform law of April 1919, under which some 4,465,300 acres were distributed to 639,000 applicants, of whom 235,000 were new farmers, and 404,000 were farmers increasing their former small holdings. Advanced farming techniques were introduced and a farm cooperative movement was established. Altogether there were 17,000 cooperatives, with a membership of 1,675,000 by 1938, and an annual business in 1935 amounting to \$591,985,000. By the agrarian reforms of 1946, which confiscated the holdings of Germans, Hungarians, and Nazi collaborators and provided for the redistribution of all holdings exceeding 123.5 acres, more than 3,300,000 additional acres were made available for distribution. A process of collectivization went forward, and a decree of the Ministry of Agriculture, of April 6, 1949, unified cooperatives as a step toward socialization. The new cooperatives were to replace the independent ones and to be supervised by the government.

Industry.—The Republic of Czechoslovakia inherited the greater part of the industrial equipment of the old Austro-Hungarian Empire. In the interwar period, from the point of view of workers employed, numbering about 350,000, and the extent of export trade, the textile industry was the most important. The cotton industry was outstanding, and flax spinning and the production of woollens significant. The Bohemian glass industry was justly famous, and its product was exported throughout the world. Closely associated with it was the Bohemian porcelain industry, based on the rich beds of kaolin clay found especially in northern Bohemia. The manufacture of boots and shoes and of chemicals were other well-developed industries. The most significant of the agricultural industries was the production of sugar, and forests gave rise to a very important lumber and wood-working industry. Iron and steel industries were largely concentrated in Bohemia and Moravia-Silesia, the principal blast furnaces being located in the Bohumín-Vítkovice district, near the Silesian coal fields of Karvinná-Ostrava. About 85 per cent of the pig iron was used domestically for the manufacture of steel and malleable iron, the most important foundries being in Kladno, Hra-

dek Komárov, Rostava-Najdek, Trinec, and Vítkovice, while Plzeň was the center of the internationally famous Skoda iron and steel works.

By decrees of October 1945, all national resources, public utilities, transport, commercial banks, insurance companies, and other important branches of industry and trade were nationalized, and in 1946 a two-year economic plan was initiated, with all heavy industry substantially nationalized. On August 5, 1948, the Ministry of Industry reorganized all Czech industry into 251 state trusts, involving about 93 per cent of Czechoslovakia's industry. In October 1948 a new five-year plan was announced which was designed to raise industrial output 57 per cent by 1953, agricultural output by 16 per cent, building activities by 130 per cent, and transportation by 40 per cent. Moreover, on February 9, 1949, it was announced that a single state planning office was to centralize economic planning throughout Czechoslovakia.

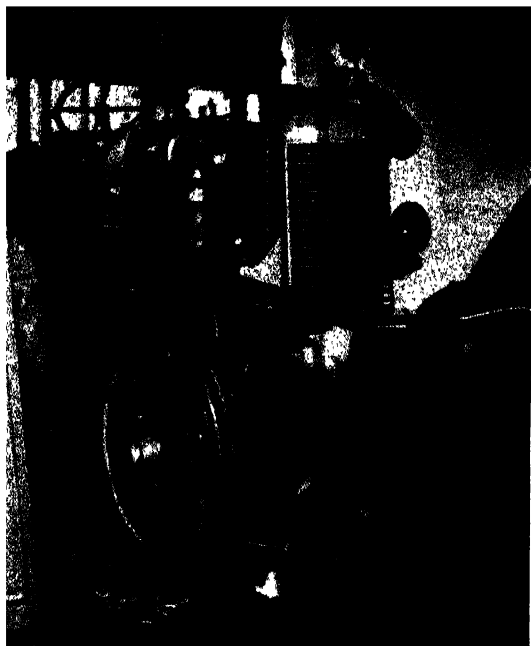
Commerce.—Possessing a well-balanced agricultural and industrial economy in the interwar period, Czechoslovakia had an increasingly important foreign trade. Primary imports were cottons, woollens, iron and steel, fats and oils, and fruits and vegetables. Among the principal export items were cottons, woollens, glassware, chinaware, sugar, cereals, timber, leather, and iron and steel. Germany, the United States, Great Britain, France, Rumania, Austria, the Netherlands, and Yugoslavia were among the principal exporters of goods to Czechoslovakia. Primary customers were Germany, the United States, Great Britain, Austria, Rumania, Yugoslavia, the Netherlands, Switzerland, and France. By 1947 Czechoslovak imports amounted to 28,635,000,000 koruny (Kč), and exports, to 28,609,000,000 Kč, the United States supplying about 10.18 per cent of the imports by value, and taking about 5 per cent of Czechoslovakia's exports. Following World War II, trade with the USSR was stimulated, and on December 11, 1947, a Soviet-Czechoslovak five-year commercial agreement was signed for the mutual exchange of \$100,000,000 worth of goods, and Czechoslovakia was drawn still further into the Soviet economic orbit. The new five-year Soviet-Czechoslovak agreement of March 3, 1950 (1951–1955) provided for a 50 per cent increase over and above the actual trade during the period of 1948–1950.

Transportation and Communication.—The inland position of Czechoslovakia, astride the principal European watershed, the long line of its frontiers, and the great length of the country from northwest to southeast (about 630 miles), all combine to make the region the great crossroads of central Europe. The railway system was inherited from the Dual Monarchy and centered about Vienna and Budapest, although Bohemia and Moravia were not badly served. Out of a total of about 8,455 miles of railways, 7,072 (84 per cent) were state owned and 1,383 (16 per cent) were privately owned. While Bohemia and Moravia-Silesia had a total of some 6,852 miles of railway, Slovakia and Ruthenia had only 1,603 miles. The railway network of the country centered around Plzeň, Prague, Hradec Králové (Königgrätz), Brno, Olomouc, Bratislava, Košice, and Bohumín, one of the most important railway centers in central Europe. In 1951 there were approximately 8,185 miles of state railways, 5,130 miles of first-class main



CZECHOSLOVAKIA: Above: Banská Bystrica, an old Slovak city in the valley of the Hron. Below left: Sunday gathering of countrypeople in the Tatra Mountains of northern Slovakia. Below right: Easter-egg decorating, one of Czechoslovakia's most renowned folk arts. (Top and below right) Eastfoto; (below left) International News





Two views inside the huge Skoda Works at Pilsen (Plzeň). Left: Tractor on the assembly line. Right: Shop in the castings department.

(Top) FPG; (bottom) Van Sprang from Black Star



Above: Street scene in the Czechoslovak capital, a corner of Wenceslaus Square, Prague.

roads, 13,114 miles of second-class main roads, and 16,767 miles of district roads. Czechoslovakia has only about 280 miles of navigable rivers. Aside from the Elbe, which renders special services through connections with Hamburg and the North Sea, and the Danube connection with the Black Sea, the single important navigable waterway is the Vltava River, which joins the Elbe at Mělník. The waterways of Slovakia provide substantially no transportation. The result is that water traffic within the country amounts to less than one tenth of that carried by the railways. On the other hand, Czechoslovakia's position in central Europe makes it very important for air transportation, and there are some 14,300 miles of air routes. In November 1947 Czechoslovakia and Poland concluded negotiations for the construction of an Oder-Danube canal to be finished in 1955.

Government.—The constitution of 1920, based largely on the American and French experience, was a thoroughly democratic instrument. It placed all citizens of the republic on a footing of individual equality before the law, provided for a cabinet-parliamentary government elected on principles of universal, direct, and secret suffrage, and embodied a system of proportional representation. But it also laid the foundations for a highly centralized state. The Czechoslovak Parliament, called the National Assembly, was composed of a Chamber of Deputies, comprising 300 deputies elected for a six-year term, and a Senate of 150 members, chosen for eight years, who jointly elected the president of the republic. Tomáš G. Masaryk served as first president from 1918 to December 1935, and was succeeded by Dr. Eduard Beneš, his close friend and collaborator. The judiciary was separate from and independent of the administration. Administrative reform, introduced as early as 1928, laid the foundations for a gradual decentralization in the republic by providing for diets and administrative machinery for the four provinces.

After World War II the Communist Party emerged as the strongest, although minority, party in the country, and following a coup d'état in February 1948, a new constitution was proclaimed on May 9, 1948, which converted Czechoslovakia into a "people's democracy." The new constitution heavily concentrated power in the National Assembly, which was elected on May 30 under a system providing for single-list voting and dictated nominations.

From the standpoint of social and economic legislation, in the interwar period, Czechoslovakia was one of the advanced democratic states in central Europe. Important land reforms stemming from 1919 laid the foundations for a democratic peasant agriculture based on private ownership of the land. There was an extensive system of social insurance, with accident insurance covering 2,000,000 workers, compulsory health insurance covering a total of 7,500,000, and about 3,000,000 persons with their families could claim a pension for retirement or disability. Although the constitution of 1920 contained important provisions regarding minorities, the problem was not solved. The constitution gave all the minorities the same civil and political rights, but on an individual, not a collective, basis. All minorities, including the Germans, were proportionately represented in Parliament and other political bodies.

By 1938 the total national debt was 47,094,000 Koruny (Kč), and the ordinary budget called

for an expenditure of 10,926,500,000 Kč, a large portion of which went to national defense. In 1951 budget estimates indicated receipts at 166,520,000,000 Kč, and expenditures at 166,267,000,000 Kč.

Education.—Under the First Republic, education was compulsory and secular in character, with provision for religious instruction. Moreover, national minorities generally had their own schools, which were conducted in their own languages. There were 28 institutions of university rank, including the famous Charles University of Prague (1348), the first university established in central Europe. Czechoslovak higher institutions were closed by the Nazis in 1939. During the 20 years of the First Republic, illiteracy was reduced to a national average of about 3.25 per cent—in Bohemia and Moravia-Silesia to 1 per cent, Slovakia to 6 per cent, and Ruthenia to 21 per cent. By 1948, there were 11,836 elementary schools with some 998,200 students; 2,122 higher grade schools with 400,000 students; and 335 secondary schools with 120,000 students. Higher technical institutions and universities had an attendance of 20,317 and 31,600 students respectively. There were about 19,000 students at the University of Prague. After the coup d'état of 1948 education came completely under Communist domination, and it was noteworthy that on July 14, 1950, independent theological institutions were abolished and state institutions substituted.

Arts and Sciences.—As in the past, Czechs and Slovaks contributed significantly to the arts and sciences during the period of the First Republic. (See also CZECHOSLOVAK MUSIC and CZECHOSLOVAK LITERATURE.) In music the traditions of Bedřich Smetana (1824-1884, q.v.) and Anton Dvořák (1841-1904, q.v.) were continued. The National Theater (Narodní Divadlo) in Prague was state supported. Karel Čapek (1890-1938, q.v.) was, perhaps, the outstanding name in recent Czechoslovak literature. Advanced scientific instruction and original investigation and experimentation were carried on in the universities and polytechnical institutions. Many industrial concerns also fostered specialized scientific investigation—radium institutes, research laboratories of the Chemical Union, the sugar and leather industries, and the forestry and agricultural commission.

Religion.—Under the Constitution of 1920 all religious confessions were equal before the law and no citizen could be compelled to take part in any religious ceremonies. Differences in religious belief were to constitute no bar to employment or promotion in public office. During the interwar period, about 75 per cent of the population or approximately 10,800,000 were Catholic, while about 8 per cent were Protestant, and about 5 per cent belonged to the Czechoslovak Church. By 1948 the religious distribution was substantially similar, with 9,300,000 Roman Catholics and 900,000 each in the Czechoslovak and the Protestant churches. About 800,000 were listed as without religious profession, and there were some 50,000 of Jewish faith and 30,000 of Orthodox faith. Under the constitution of 1948, as under that of 1920, there was no established church, although the government granted subsidies to all churches. By June 1949 the Communist government began its drive against the Roman Catholic Church, with a bill which was to make state employees of all theo-

logical teachers and place all priests on the government payroll and, therefore, under government supervision. By a law of October 14, 1949, the National Assembly approved legislation depriving the Catholic hierarchy of independent status and, in effect, compelled its members to become civil servants of the Communist government. Catholic bishops refused to submit to these and other laws because of their view that religious freedom would thereby be destroyed. The campaign against the church continued throughout 1950 and 1951. It was announced in March 1951 that 6 churchmen, including 4 Catholic bishops, had sworn loyalty to the Communist regime in Prague.

HISTORY

Early History.—The Czechs and Slovaks, related Slavic elements whose history forms the background of Czechoslovakia, trace their origins into the early Middle Ages. Although the Slovaks fell under Magyar domination in the 11th century, the Czechs, under Charles IV (1346-1378, q.v.), played a leading role in the Holy Roman Empire. The beginnings of the Protestant revolt may be traced to the Hussite movement in Bohemia (see *HUSSITES*). In 1526 Ferdinand I (1503-1564, q.v.) of Habsburg became king of Bohemia, while in 1620, after the Battle of the White Mountain (Nov. 8, 1620), came the defeat of the Czechs, the subjugation of Bohemia, the end of political independence or autonomy, the execution of the leading rebels, and the stamping out of Bohemian Protestantism. An awakening came only in the national and democratic uprisings of 1848-1849 in the Austrian Empire. The Habsburgs failed subsequently to solve the national problem, with the result that during World War I, under the leadership of Professor Tomáš G. Masaryk (1850-1937, q.v.), Czechs and Slovaks gradually united in revolt and moved toward a common destiny in independence. Masaryk was ably assisted by Dr. Eduard Beneš (1884-1948, q.v.).

The First and Second Republics.—As head of the Czechoslovak National Council, Professor Masaryk, on June 30, 1918, signed an agreement between Czechs and Slovaks in the United States at Pittsburgh, Pa., for the foundation of a new state. The United States, Great Britain, France, and Italy recognized the right of independence in the summer and fall of 1918. On Oct. 14, 1918 Dr. Beneš announced the establishment of a provisional government. Masaryk proclaimed independence in Washington on October 18, and on October 28 in Prague.

Following adoption of the constitution of Feb. 29, 1920, the Czechoslovak government began the business of solving the country's financial, social and economic, agricultural, and other problems. Despite sincere efforts, the problems of minorities and of administrative decentralization seemed to defy solution.

In foreign policy Czechoslovakia was aligned with the League of Nations, in which Dr. Beneš played a leading role; with the Little Entente (1920-1921), composed of Czechoslovakia, Yugoslavia, and Rumania; and with France (1924) and the Soviet Union (1935). Relations with Germany improved after the negotiation of the Locarno treaties (1925-1926). In general, Czechoslovakia pursued a pacific and constructive policy toward its neighbors.

Nevertheless, with the advent of Hitler to

power in Germany and the organization of the Sudeten German Party in Czechoslovakia, together with the coming of the world depression (1929) and the breakdown of the system of collective security under the League of Nations, the position of Czechoslovakia became increasingly precarious. The year of crisis came in 1938, after the German occupation of Austria. Neither Great Britain, under the League of Nations, nor France, under the 1924 alliance, came to the aid of Czechoslovakia. In the interest of "peace in our time" an agreement was reached at Munich on Sept. 29, 1938, which resulted in the first partition of Czechoslovakia at the hands of Germany. On Nov. 2, 1938, through the Vienna "award" Hungary shared in the partition. As a result Czechoslovakia lost 16,686 square miles in area, with a population of some 5,000,000, of whom more than 1,000,000 were Czechoslovaks.

The complete destruction of the First Czechoslovak Republic followed within less than six months. Dr. Beneš resigned on Oct. 5, 1938. On October 8, "autonomy" was given to Slovakia and Ruthenia. On November 30, Dr. Emil Hácha (1872-1945) was chosen president of the "Second Republic." On March 15, 1939, after difficulties were stimulated and arranged by Nazi Germany, German troops marched into Prague. On March 16 Hungary annexed Ruthenia, Hitler established the "Protectorate of Bohemia-Moravia," and the "independent" state of Slovakia was placed under the "protection" of the fuhrer.

World War II.—With the outbreak of war in September 1939 underground resistance to the Germans was organized, and it continued despite German efforts to win the collaboration of the people through persuasion and increased terrorism. During the war some 60,000 Czechoslovaks died under the Nazi terror; 200,000 were sent to concentration camps; and more than 1,500,000 were displaced. By November 1939 a Czechoslovak National Committee, with Beneš at its head, was organized and was recognized by both Great Britain and France. Full recognition of the Czechoslovak government in exile was extended by the Soviet and British governments on July 18, 1941, and by the United States on Oct. 28, 1942.

The Czechoslovak government in exile was one of the original signatories of the United Nations Declaration on Jan. 1, 1942. During 1942 it negotiated with Great Britain, the USSR, and the "Fighting French" for the nullification of the Munich agreement. A treaty of mutual assistance was signed with the Soviet Union on Dec. 12, 1943, and on May 8, 1944, a civil affairs agreement was signed to regulate civil administration when Soviet forces entered Czechoslovakia. The Czechoslovak government in London looked forward to the establishment of democratic government based on a broad program of administrative decentralization, simplification of the multiparty political structure, an extension of the land reform of 1919, and the socialization of economic life.

Liberation.—In May 1945 Czechoslovakia was freed by Soviet and United States armies with the assistance of resistance forces at home, and the Czechoslovak government returned to Prague, with President Beneš at its head and Zdenek Fierlinger as prime minister. At once the government initiated a program of recon-



International News

Jagged Lomnický štít (Lomnice Peak) in the Tatra Mountains.



FPG

Left: Cherry picking in a Slovakian orchard. Right: Scraping hides in a leather factory.



In Slovakia. Left: A band of musicians marching in the procession. Right: The bride thanks the guests for her wedding gifts.



Left: Harvesting sunflowers near Bratislava. Right: Oral examination in the Slovak language at a secondary school in Bratislava.

Eastfoto

struction which called for a great degree of nationalization of the economic life of the country and autonomy for Slovakia, although the definitive constitutional structure was ultimately to be decided by an elected constituent assembly. On June 29, 1945, Czechoslovakia and the Soviet Union signed an agreement whereby Ruthenia, with a population of some 725,000, was incorporated into the Ukrainian SSR. The Czechoslovak government also began the process of transferring large segments of the German and Magyar populations because of their disloyalty during the period of 1938-1945. While this included some 2,500,000 Sudeten Germans and about 100,000 of the Magyar ethnic group, it was pointed out that Czechoslovakia would gain in ethnic homogeneity and political unity.

Immediately following its liberation, Czechoslovakia based its foreign policy primarily on its alliance with the Soviet Union. Czechoslovakia expected, however, to continue as an independent state and to remain in association with Great Britain and the United States, in accordance with the frequently expressed views of President Beneš and Foreign Minister Jan Masaryk (q.v.) that Czechoslovakia could become a "bridge between East and West." Czechoslovakia was represented at the San Francisco Conference and became an original member of the United Nations.

The Road to Communism.—It was soon evident that Czechoslovakia was not to be reconstructed as President Beneš had hoped. In the elections of May 26, 1946, the Czechoslovak Communist Party emerged as the strongest party, polling about 31 per cent of the total Czech vote and 35 per cent of the Czech-Slovak vote. Parties of the Left received a total vote of some 3,601,669 and a parliamentary representation of 153, while those of the Right received 3,456,687 votes and a representation of 147 in Parliament. On June 19, 1946, President Beneš was unanimously re-elected for a third term until a new constitution was drafted and an election held. Klement Gottwald (q.v.) became prime minister in the reshuffling of the Cabinet on July 2, 1946, Jan Masaryk remaining as foreign minister.

The government now faced the problems of drafting a new constitution, further distributing land, and nationalizing industry, natural resources, and finance. A new two-year economic plan was enacted into law on October 28, 1946. On September 25, 1946, Premier Gottwald stated that the dictatorship of the proletariat was not the only road to communism, implying that the goal might be achieved through democratic processes. While there were no major incidents in Czechoslovakia during 1947, the Communist Party, in control of police, judiciary, and the army, gradually prepared for taking command of the country, under the façade of legalism. During the latter part of 1947 the interparty truce ended and in September a Slovak terrorist plot was uncovered and 80 leaders were arrested. There was evidence of large-scale disaffection in the country.

Discussions in the Cabinet on the issue of whether the organization of the police was to be the subject of a majority Cabinet decision precipitated a crisis from Feb. 17 to 27, 1948. Deputy Foreign Minister V. A. Zorin, of the Soviet Union, had come to Prague, evidently for the purpose of lending encouragement to the Communist minority. On February 20, 12 members of the Cabinet, representing the National Social-

ists, the People's Party, and the Slovak Democrats, resigned. During the course of the crisis Communist "action committees," modeled on the "soviet" pattern, under the direction of the Central Action Committee in Prague, with Rudolf Slansky, secretary general of the Communist Party, in charge, stimulated uprisings and strikes. On February 25, President Beneš approved a new Cabinet, with Premier Gottwald at its head, consisting primarily of members of the Communist Party, with limited non-Communist representation. Members of the historic political parties were soon arrested or fled into exile. On February 26, 1948, the governments of the United States, France, and the United Kingdom condemned the developments in Czechoslovakia. On March 10 Jan Masaryk, the foreign minister, was killed in a fall from his office window at the Czernin Palace, and on the same day, Jan Papanek, the representative of Czechoslovakia to the United Nations, requested that "... this situation which enslaves the people of Czechoslovakia ... be brought to the Security Council for consideration."

On May, 9, 1948, the National Constituent Assembly accepted a new constitution and then was dissolved on June 5. President Beneš refused to sign the constitution, resigned on June 7, and died on September 3, 1948. Klement Gottwald was thereupon unanimously chosen president by the National Assembly on June 14, and Antonín Zápotocký became premier on June 15. These changes were endorsed by voters in single-list elections for a new National Assembly, held on May 30, in which the government bloc received 89 per cent of the total vote. Public voting prevailed in many places. On June 27 the Communist and Social Democratic parties were amalgamated into the Czechoslovak Communist Party. In October the National Assembly approved bills creating forced labor camps and establishing wages of all but state employees. In December, book censorship was instituted, only those books approved by the Ministry of Information being published. In March 1949 the "action committees" were fully legalized and given the task of "national consolidation" on all levels of administration. By June 1949 the drive against the Catholic Church began, and Rudolf Slansky advised the Communist Party that further drastic purges would be necessary, since many of the approximately 1,600,000 members of the party had joined its ranks for opportunistic reasons. In October 1949 it was estimated that no less than 50,000 persons had been seized in Bohemia and Moravia in the government's efforts to "liquidate hostile elements and imperialist agents." In 1950, to conform with Soviet legislation, the death penalty was prescribed for sabotage, espionage, and other "crimes against the state."

Czechoslovakia signed alliances, within the Soviet framework, with Yugoslavia (1946), Poland (1947), and Hungary and Rumania (1948). On December 11, 1947, the USSR and Czechoslovakia signed a five-year commercial agreement which drew Czechoslovakia more closely into the planned economy of the Soviet Union. Meanwhile the Czechoslovak Communist Party became a member of the Cominform and was also brought into the Soviet Union's Council for Economic Mutual Assistance, in a further attempt to integrate the Czechoslovak economy with that of the Soviet Union. Like other Communist

governments, Czechoslovakia broke with Yugoslavia following the latter's defection from the Cominform on June 28, 1948. Since 1948 there has been no Czechoslovak deviation from Soviet foreign policy. Both in domestic organization and goals and in foreign policy, Czechoslovakia remained simply a satellite of the Soviet Union.

Relations between the United States and Czechoslovakia steadily worsened in the years following 1948. After the trial and "conviction" of an American Associated Press correspondent, William N. Oatis, in July 1951, for alleged espionage, the United States prohibited private travel to Czechoslovakia. Commerce was curbed, and the United States House of Representatives, on August 14, 1951 by a vote of 231 to 1, proposed the complete severance of all commerce, the average annual Czechoslovak export to the United States being about \$25,000,000.

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HARRY N. HOWARD,
*United Nations Adviser, Bureau of Near Eastern,
South Asian and African Affairs, Department
of State.*

CZERMAK, chér'mäk, **Johann Nepomuk**, Bohemian physiologist: b. Prague, June 17, 1828; d. Leipzig, Sept. 16, 1873. He studied at Vienna, Breslau, and Würzburg, lectured at Prague, and held professorships at Graz (1855-1856); Kraków (1856-1858), Budapest (1858-1860), and Jena (1865-1869). From 1869 until his death he taught at Leipzig. He invented and introduced the laryngoscope and the rhinoscope, and discovered a new method for the the therapeutical surgical treatment of diseases of the epiglottis and throat. His work on the laryngoscope was translated into several languages.

CZERNIN VON UND ZU CHUDENITZ, chér'nén fón öönt tsöö kso'dé-nits, **COUNT Ottokar**, Austro-Hungarian statesman: b. Dimokar, Bohemia, Sept. 26, 1872; d. Vienna, April 4, 1932. He entered the diplomatic service as a young man, and became a member of the diet of Bohemia in 1903 and of the Austrian upper house nine years later. Appointed minister to Bucharest in 1912, he succeeded in preventing Rumania from entering World War I on the side of the Allies during the early stages of the conflict. At the close of 1916 he became minister of foreign affairs, and in this capacity he was largely responsible for the efforts made

by Emperor Charles I (q.v.) to conclude a peace at the earliest moment. He was the chief delegate of Austria-Hungary at negotiations with the Russians in 1917 which resulted in the Treaty of Brest-Litovsk, but soon thereafter was in disagreement with the king respecting policy and resigned his office. From 1920 to 1923 he was a representative of the liberals in the legislature of the republic of Austria. He wrote *Im Weltkrieg* (1919).

CZERNY, chér'né, **Karl**, Austrian pianist and composer: b. Vienna, Feb. 21, 1791; d. there, July 15, 1857. He studied the piano under Ludwig van Beethoven (q.v.) from 1800 till 1803, and when, at the age of 15, he began giving concerts, he was enthusiastically received in the musical world. Although he composed nearly a thousand musical works, he is best remembered for his piano exercises, which included *The School of Fingering*, *The School of Velocity*, and *The School of Virtuosity*.

CZESTOCHOWA, chén-stó-kô'vä, Poland, city of the province of Kielce, on the river Warta, 140 miles southwest of Warsaw. The city, which lies near an important coal mining area, has numerous industrial plants, including cotton mills, foundries, paper mills, and breweries. On a steep hill above the city stands the famous monastery of the Order of Saint Paul the Hermit, which is visited annually by many thousands of pilgrims, it possesses a celebrated image of the Virgin, made of dark wood, traditionally believed to have been painted by Saint Luke. The monastery, at one time strongly fortified, resisted a notable siege by the Swedes in 1655; it fell to the Russians, however, in 1772, and in 1793 it was captured by the Prussians. Pop. (est. 1939) 138,000.

CZOLGOSZ, chöl'gôsh, **Leon**, American assassin: b. Detroit, Mich., 1873; d. Auburn, N. Y., Oct. 29, 1901. Of Polish-German ancestry, while employed as an ironworker in his native city he became an anarchist. On Sept. 6, 1901, he shot and fatally wounded President McKinley, who was holding a public reception at the Pan-American Exposition, Buffalo, N. Y. The President died on September 14, and Czolgosz was shortly brought to trial and sentenced to death on September 26. He was executed in the prison at Auburn, N. Y. See also MCKINLEY, WILLIAM.

CZUCZOR, tsöö'tsör, **Gergely**, Hungarian poet and philologist: b. Andod, Dec. 17, 1800; d. Pest, Sept. 9, 1866. He was a Benedictine monk, and the eroticism of the first collection of his *Poetical Works* (1836) brought on him stern censure from his superiors. From 1825 to 1835, he was professor in the gymnasium at Raab and Komorn. He left the latter to accept a post as second secretary and keeper of the archives of the Hungarian Academy. Under these auspices he began the edition of the great lexicon of the Hungarian language published in six volumes 1861-1874, of which four volumes were edited by him. His works are not scientifically accurate, because of his ignorance of comparative philology. He is best remembered for his poems, a later edition of which appeared at Pest in 1858. His two fine hero-ballads, *The Battle of Augsburg* (1824) and *The Diet of Arad* (1828) brought him instant celebrity. In 1848 he published *Riadó*, a passionate appeal to Hungarian national sentiment, and was imprisoned for it.



D the 4th letter of the English alphabet (see article on **A**) and of related European alphabets (except the Slavonic) as well as of the Latin, Greek, and North Semitic alphabets from which the English is descended. With very slight variations the value of the symbol and its form are also identical in all these alphabets, as well as its place in the order. In the eastern Greek alphabet, as in the Semitic, it is Δ (right to left) or Δ. The Hebrew name is *dāleth* (in Arabic *dāl*, now the 8th letter), earlier *delt* (compare Greek *delta*), the original meaning of which appears to have been "door," perhaps properly the folding door (flap) of a tent. But in the Chalcidian (Western) Greek alphabet, from which the Latin comes, it has the rounded form **D**, which still survives. Although Etruscan has no *d*-sound, the symbol appears in early Etruscan *abc*'s, if not in the syllabary, and must have existed in the source of the Latin alphabet, unless it was introduced under Greek influence. But this supposition is improbable; for in other Italic alphabets, also borrowed from Etruscan, *d* was at first wanting, but was subsequently supplied from a variant of *r*, namely *ṛ* and *ḡ*, then reintroduced in that shape as being less likely to be confused with a current form of *r* (*ṛ*), with the result that in the Oscan alphabet *ṛ* and *ḡ* (right to left) have the values of *d* and *r* respectively; but Umbrian has to use *ṛ* (that is *t*) for both *d* and *t*, though it has *ḡ* (*d* or *ṛ*) for a sound (something like Czech *ř*) that arose from *d* between vowels. The confusion of *d* and *r* symbols is the more easily intelligible, since the sounds which they denote are close together; thus Latin *rarus* has become *rado* in Italian, just as Latin itself borrowed Greek *ῥαβδίκιον*, "herald's staff," as *caduceus*.

The sound denoted by *d* in modern English is postdental (that is, it is formed with the tongue not on the teeth as in French *d*, but on the alveolar ridge). In American English a mere alveolar flap is very often produced instead of an intervocalic *d* (or *t*) in words like *medal*, *better*, the sound then not differing greatly from a semirolled *r* ([*lɛrə*] for *letter*); Cockney English does the same. In modern Greek *ð* (except after *v*, *n*) denotes a voiced dental spirant (the sound of *th* in English *then*), like Spanish *d* between vowels; finally in Spanish, especially in southern Spain and in Latin America, the same sound is heard, or a breathed dental spirant (English *th* in *thin*), or may be entirely silent, as in *usted* (also written *usté*).

Actually English *j* contains a *d*-sound followed by *i* (*s* as in *azure*), for example in *jam*; but the same consonant cluster is also written *g* (as in *gem*) and even *dg* (as in *badge*, *bridge*). Further, final *d* (*ed*) has become *t* after breathed consonants in the preterite and past participle of

weak verbs, as in *chaffed*, *liked*, *jumped*, *danced*, *crunched*, all of which are pronounced with *t*, not *d*. This change has taken place since the Middle English period, but the archaic writing still survives. In earlier modern English *t* was often written (*thankt* or *thank't* for *thanked*, *wisht* for *wished*), and the double spelling still appears in a few verbs (*blest*, *spelt*, *stript* as well as *blessed* and so on). In early Middle English the preterite ended in *ede* or *de* (*te*), the past participle in *ed* or *d* (*t*); with the loss of final *e* in the preterite in Middle English, and of *e* before *d* (*t*) in both preterite and participle in early modern English, all these forms have become identical in termination, both in spelling and in pronunciation.

The phoneme *d* occurs initially (*din*), medially between vowels (often written double, *rudder*), and finally (*bad*), as well as in the familiar consonant clusters *dr* (*drill*, *children*), *dw* (*dwell*). We now have voiced *th* for an older *d* between a vowel and vocalic *r* (*father*, Middle English *fader*), save in loan words (*consider* or late formations (*rider*). The *d* heard in *almonds*, *hands*, *grandmother* is a restoration due to the influence of the written form. On the other hand *lawn*, *groin*, *woodbine* all have lost a final *d*; but the *d* of *bound*, and of the verb *pound*, is an innovation.

English *d* corresponds to Indo-European *dh* (*deed*, Sanskrit *dhāma*, "law") or under certain conditions *t* (*hund-red*, Latin *centum*), just as *t* corresponds to *d* (*ten*, Latin *decem*). Hence *t* in *tear* corresponds to *d* (Greek *δάκρυ*); the borrowed *lacrimose* is ultimately cognate, *d* having become *l* in some Latin words. This relationship helps to account for Latin *Ulysses* from Greek *Odysseus*.

The abbreviation **D** for 500 is really the Roman numeral, in origin one half of **Φ** (Greek **φ**) used to denote 1000 (as in the familiar **M**, a modified form of **Φ** through an intermediate **Ϟ**, helped by association with *mille*, "1,000").

JOSHUA WHATMOUGH.

DAB, a popular name used for several flounders (subfamily Pleuronectidae) of the genera *Limanda* and *Hippoglossoides*, species of which are found on the Atlantic coast of North America and the coasts of northwestern Europe.

DABCHICK, a grebe, *Podiceps ruficollis*, found in England and throughout most of the Old World. Closely related species, one of which is the least grebe (*P. dominicus*) of the New World, inhabit other parts of the globe. Dabchicks are the smallest of grebes and lack the ornamental ear tufts often present in their larger relatives. About 10 inches in length, dabchicks are grayish black above and lighter below, and

sometimes have a tinge of rufous on neck or chest.

D'ABERNON, dăb'ēr-nūm, 1st Viscount (EDGAR VINCENT), English financier and diplomat: b. Slinfold, Sussex, England, Aug. 19, 1857; d. Hove, Sussex, Nov. 1, 1941. Educated at Eton, he was a member of the Coldstream Guards from 1877 to 1882. In 1882 he became British, Belgian, and Dutch representative on the Council of the Ottoman Public Debt at Constantinople, and served as president of the council in 1883. He was financial adviser to the Egyptian government from 1883 to 1889, and governor of the Imperial Ottoman Bank thereafter until 1897. During the years 1899–1906 he was a Conservative member of Parliament for Exeter. As British ambassador to Germany from 1920 until 1926, he helped to bring into being the Dawes Plan and the Locarno Pact. He was at the head of a British economic mission to Argentina and Brazil in 1929. Of his three-volume *Diary of an Ambassador* (1929–1931; also called *An Ambassador of Peace*) the third volume, *Dawes to Locarno 1924–1926*, has perhaps the most interest. His other works include *A Grammar of Modern Greek* (1881) and *The Economic Crisis—Its Causes and the Cure* (1931).

DABLON, dă'blōn', Claude, Jesuit missionary: b. Dieppe, France, about 1619; d. Quebec, Canada, 1697. He entered the Society of Jesus in 1639, and in 1655 was sent to Canada. In the same year he was sent with Pierre Joseph Marie Chaumonot to establish a mission among the Iroquois. The result of this trip was a decision to establish a French settlement among the Iroquois, and Dablon headed the colony from 1656 until March 1658. In 1661 he went on a missionary journey northward with Gabriel Druillettes. Later, he became superior of the Ottawa mission, with headquarters at Sault Sainte Marie, and accompanied Claude Jean Allouez into central Wisconsin in 1670. Named superior of all Canadian missions in 1670, he took office in 1671, and served until 1680; he was again superior from 1686 until 1693. He appointed Jacques Marquette to accompany Louis Jolliet on the expedition that resulted in the discovery of the upper Mississippi. His contributions to *The Jesuit Relations* are of value for their descriptions of places and peoples and for their clear, detailed narration of events. He edited the published *Relations* of 1670–1671 and 1671–1672.

DABNEY, dăb'nī, an outstanding American family, said to have descended from Cornelius Dabney, or d'Aubigné, a French Protestant who settled in Virginia in the colonial period.

ROBERT LEWIS DABNEY, Presbyterian clergyman, b. Louisa County, Va., March 5, 1820; d. Victoria, Texas, Jan. 3, 1893. He graduated from the University of Virginia in 1842, and after two years of study at the Union Theological Seminary, Virginia, became, in 1846, a minister. He was a professor at the seminary from 1853 to 1883, and at the University of Texas from 1883 to 1894. A Confederate Army chaplain during the Civil War, he was on Stonewall Jackson's staff in 1862. His chief book is *Life and Campaigns of Lieutenant-General Thomas J. Jackson (Stonewall Jackson)* (1866). Among his other works are *A Defense of Virginia and*

the South (1867), *Sacred Rhetoric* (1870), and *Parental Obligation* (1880).

VIRGINIUS DABNEY, author and educator: b. "Elmington" estate, Gloucester County, Va., Feb. 15, 1835; d. New York, N. Y., June 2, 1894. After studying at the University of Virginia, he practiced law at Memphis, Tenn. He served in the Confederate Army throughout the Civil War. Thereafter he had charge of several preparatory schools, including the New York Latin School, which he conducted for almost 20 years until 1893. He worked on the editorial staff of the *New York Commercial Advertiser*. His first novel, *The Story of Don Miff* (1886), conveyed the author's criticism of the social order evolving in America, and achieved a certain popular success. His second novel, *Gold that Did Not Glitter* (1889), had less success.

RICHARD HEATH DABNEY, university professor and historian: b. Memphis, Tenn., March 29, 1860; d. Charlottesville, Va., May 16, 1947. His father was Virginius Dabney (1835–1894). He received the M.A. degree at the University of Virginia in 1881, taught at the New York Latin School in 1881–1882, studied at the universities of Munich, Berlin, and Heidelberg from 1882 to 1885, and took his Ph.D. degree at Heidelberg in 1885. From 1886 to 1889 he was professor of history at Indiana University. He taught history at the University of Virginia from 1889 to 1938, holding the rank of full professor from 1897 and acting as dean of the department of graduate studies during 1905–1923. He published *The Causes of the French Revolution* (1888), *John Randolph, a Character Sketch* (1898), and numerous articles in periodicals.

CHARLES WILLIAM DABNEY, educator and agriculturist: b. Hampden-Sydney, Va., June 19, 1885; d. Asheville, N. C., June 15, 1945. He received the A.B. degree at Hampden-Sydney College in 1873, studied at the University of Virginia from 1874 to 1877 and at the universities of Berlin and Göttingen from 1878 to 1880, and received the Ph.D. degree at Göttingen in 1880. During 1877–1878 he was professor of chemistry at Emory and Henry College, and during 1880–1881 professor of chemistry at the University of North Carolina. He was director of the North Carolina Agricultural Experiment Station and state chemist from 1880 to 1887; president of the University of Tennessee, 1887–1904; assistant secretary of agriculture of the United States, 1893–1897; and president of the University of Cincinnati, 1904–1920. He discovered phosphate and tin-ore deposits in North Carolina. His published works include *Universal Education in the South*, 2 vols. (1936) and articles on scientific and educational subjects.

VIRGINIUS DABNEY, newspaper editor: b. University (now Charlottesville), Va., Feb. 8, 1901. The son of Richard Heath Dabney, he received the A.B. degree at the University of Virginia in 1920 and the A.M. degree there in 1921. Following a year of teaching at the Episcopal High School in Alexandria, Va., he became, in 1922, a reporter on the *Richmond News Leader*. He left that newspaper in 1928 to join the editorial staff of the *Richmond Times-Dispatch*, of which he became editor in 1936. In 1948 he was awarded a Pulitzer Prize for his editorial writing. He is the author of the books *Liberalism in the South* (1932), *Below the Potomac* (1942), and *Dry Messiah; The Life of Bishop Cannon* (1949).

DABOIA, an alternate name for Russell's viper, or the tic-polonga, *Vipera russellii*, of India, Thailand, southern China, and Formosa. There is also a population over 1,000 miles from this region on Endeh and Komodo islands (near Flores) and Java, representing a remarkable case of discontinuous distribution of an animal. Sometimes over six feet in length, the daboia is one of the larger true vipers, and ranks with the cobra and king cobra among the most dangerous venomous snakes of Asia.

SAM McDOWELL.

DA CAPO, *dä kä'pō* (Ital., "from the head or beginning"), in music, an expression written at the end of a movement to tell the performer that he is to return to and end with the first strain. It is frequently used in the abbreviated form D.C. Standardization of the *aria da capo* in opera is ascribed to the Italian composer, Alessandro Scarlatti (1659–1725), whose melodies cast in this form won astonishing popularity. Examples of *da capo* form, however, occur even earlier in Italian music. The ternary form of *la capo* is thought to have influenced the later development of sonata and sonata form (q.v.).

DACCA, *däk'ä*, a division of the East Bengal Province of Pakistan. Located in the central part of the province and covering an area of well over 15,000 square miles, it contained in 1954 the districts of Dacca, Mymensingh, Faridpur, and Bakarganj. Until 1947 it was part of India. The capital is the city of Dacca. Pop. (1951) 16,258,000.

DACCA, district, Dacca division, East Bengal Province, Pakistan. Located in the eastern part of the division, it has an area of 2,738 square miles. The surface is an uninterrupted flat, and the periodical inundations of the Jamuna, Padma, and Meghna rivers give rise to an extraordinary fertility. Crops include jute, rice, tobacco, sugar cane, wheat, and oilseeds. There is diverse manufacturing. The Madhupur Jungle is in the northern part of the district. The district's capital is the city of Dacca. Pop. (1951) 1,089,000.

DACCA, city, Pakistan, located in the Dacca district of Dacca division East Bengal Province, just west of the Meghna River. It is the capital of East Bengal Province and of Dacca division and Dacca district, and is a trade and manufacturing center. During the period 1608–1704 it served as the capital of Bengal, and from 1905 to 1912 as the capital of the Indian province of Eastern Bengal and Assam. It was at one time celebrated for its hand-woven muslins, which are of singular delicacy and beauty. The city has hippyards, and jute pressing is an important industry. Other industries produce shell bracelets, silver filigree, electrical supplies, and chemicals. Dacca University was founded in 1921. There are ruins of mosques and other old buildings. Pop. (1951) 276,033.

DACE, a name rather loosely applied to various species of small freshwater fishes of the minnow family (Cyprinidae), but especially to members of the genus *Leuciscus*, of which 2 North American species are discriminated; others belong to *Rhinichthys*, *Notropis* and *Semotilus*, those of the latter being also called

clubs and roach. *Semotilus atromaculatus*, the horned dace, is one of the best known and largest species, and abounds in the small brooks of the eastern half of the United States. As in many of the other species, the upper surface of the head of the male is ornamented during the breeding season with cutaneous tubercles. Because of their abundance the dace are important as furnishing food for larger fishes, and some of the larger species are much sought by juvenile anglers. The European dace (*Leuciscus leuciscus*) is common in British rivers, as well as in those of France, Germany, and Italy. It prefers deep, clear streams and swims in shoals. See also CYPRINIDAE.

DACH, *däk*, Simon, German lyric poet: b. Memel, Lithuania, July 29, 1605; d. Königsberg (now Kaliningrad), East Prussia, April 15, 1659. He received his early education at Königsberg, Wittenberg, and Magdeburg, and studied theology at the University of Königsberg. In 1639 he secured the chair of poetry at the university; he held it until his death. He wrote religious songs and occasional poems with a melancholy flavor, many of which were set to music by Heinrich Albert. The folk song *Anke von Tharaw*, long attributed to him, was probably written by another. A collection of his works, *Kurbrandenburgische Rose*, honoring the electors of Brandenburg, who had sponsored his career, appeared in 1661.

DACHAU, *däk'ou*, town, Germany, located in Upper Bavaria government district, Bavaria, on the Ammer River, 10 miles north-northwest of Munich. A market town in the western zone, Dachau gave its name to the infamous concentration camp which lay east of it from 1933 to 1945. The camp was first used for German opponents of Hitler; beginning in 1938, for Austrians and Czechs; and after the start of World War II, for civilians from countries conquered by the Germans. The Nazis systematically liquidated thousands of Jews, political prisoners, and slave laborers at Dachau, using means such as a gas chamber for mass executions. In the spring of 1945, when Americans liberated the camp, it had 32,000 prisoners and 200 storm troopers. The living, half-alive though they were, had prevented further killings by a revolt just prior to their liberation. Bodies which had not reached the crematorium were stacked high. In 1950 a statue by Fritz Koelle was unveiled at the site to commemorate those who had been dehumanized and murdered at Dachau. The town itself is a rail junction and manufactures such products as machinery and paper. Pop. (1951) approximately 23,700.

D'ACHE, Caran. See CARAN D'ACHE.

DACHSHUND, *däks'höönt'*, a breed of small German hounds which are characterized by long, cylinder-shaped bodies and short, sturdy, dwarfed legs. The color of the breed is black and tan or solid red (tan), and its weight ranges from 15 to 22 pounds and over. Its feet are especially suited for digging purposes. The short-coated dachshund is the most common variety. The long-haired and wire-haired varieties are products of cross-breeding with Skye, Scottish, and other terriers, or with the cocker spaniel. Though slow in movement, the dachshund has a

keen scent and great power of endurance, and thus is valuable as a hunting dog when suitably trained. It makes a good house pet. Akin to the old English turnspit, it also resembles a dog depicted on ancient Egyptian monuments. See also Dog—*Sporting Dog Group*.

DACIA, dā'shi-ā, in ancient times, a district north of the Danube, inhabited by the Daci or Getae, afterward a Roman province. It was bounded northward by the Carpathians, northeastward by the Tyras (Dniester), and westward by the Tissus (Tisza); and covered the region now constituted in Rumania, including Transylvania. In about 60 B.C. the Dacian tribes were united by Burebistas, but after the death of this chieftain his empire disintegrated. Later, however, Decebalus succeeded in reuniting it, and the Roman emperor, Domitian, attacked Dacia in 86–89 A.D. Emperor Trajan attacked it in 101–102 and 105–106 A.D., taking the capital, Sarmizegetusa, and finally erecting Dacia into a Roman province, in about 106 A.D. The Romans ruled the province until the reign of Emperor Aurelian (270–275 A.D.), when they withdrew from the region to the north of the Danube, and assigned to the Roman colonists of Dacia a territory on the south of the Danube lying between Moesia Superior and Moesia Inferior, which was hence called Dacia Aureliani. The former Dacia was now overrun by such tribes as the Goths, Huns, and Avars, and its later history became one with that of the political units later comprised in Rumania.

DACIER, dā'syā', André, French classical scholar: b. Castres, upper Languedoc, France, April 6, 1651; d. Paris, Sept. 18, 1722. He studied at Saumur under Tannegui Lefebvre. After the death of Lefebvre, in 1672, he went to Paris, where, in 1683, he married Anne Lefebvre, the daughter of his former teacher. He was an editor of the Delphin classics (q.v.), and served as librarian at the Louvre. In 1695 he was elected a member of the Académie des Médailles (later Académie des Inscriptions et Belle-Lettres) and the Académie Française, and in 1713 he became perpetual secretary of the latter. François de Salignac de la Mothe-Fenelon addressed to him his *Lettre sur les occupations de l'Académie*. His works include editions of Marcus Verrius Flaccus and Sextus Pompeius Festus (1681) and translations of the works of Horace (1681–1689), Hippocrates (1697), and Epictetus (1715), and of Aristotle's *Poetics* (1692), Sophocles' *Electra* and *Oedipus at Colonus* (1692), several of Plato's *Dialogues* (1699), and Plutarch's *Lives* (1694–1721).

DACIER, Anne Lefebvre, French classical scholar: b. Saumur, France, March 1654; d. Paris, Aug. 17, 1720. The daughter of Tannegui Lefebvre, she went to Paris after his death in 1672, and published there an edition of Callimachus. Her marriage in 1683 to André Dacier did not interrupt her learned work, which included preparing editions of Florus, Sextus Aurelius Victor, Eutropius, and Dictys Cretensis for the Delphin classics (q.v.). Both she and her husband became Roman Catholics in 1685. She published prose translations of Sappho and Anacreon in 1681; in 1683–1684 appeared her prose translations of plays by Aristophanes and Titus Maccius Plautus, and in 1688 her trans-

lation of Terence. Her prose translations of the *Iliad* (1699) and the *Odyssey* (1708) brought these works to the attention of many for the first time. She ardently defended the ancients against such a spokesman for the moderns as Lamotte-Houdar, and directed against the latter her *Des causes de la corruption du goût* (1714). In 1716, in *Homère défendu contre l'apologie du P. Hardouin ou suite des causes de la corruption du goût*, she attacked the apology for Homer published by Jean Hardouin.

DACITE, a group of rocks that strongly resemble the rhyolites. The light colored minerals, quartz and feldspar, give character to both, but in the dacites the predominant feldspar is a plagioclase of acidic or medium composition. Biotite is about the most common of the dark silicates contained in the dacites, hornblende is next, and augite appears in some dacites. Colors range from light grays to yellows and pale reds. Glasses and cellular lavas are not uncommon forms.

The dacites proper are felsites. Where phenocrysts are abundant these rocks are dacite-porphyrries. The cellular structure is not common, but the groundmass is dense and felsitic. Quartz and striated plagioclases form recognizable phenocrysts. The interiors of thick surface flows, dikes, intrusive sheets, and the outer parts of laccoliths are the special homes of dacite-porphyrries.

Where phenocrysts are in marked excess over the groundmass, the rocks are quartz-diorite-porphyrries. Where the phenocrysts are numerous they are generally larger, and the groundmass between them slightly coarser, than in dacite-porphyrries. These rocks are met in deep-seated dikes, in thick sheets, and in the central parts of laccoliths. They mark a textural transition to quartz-diorite.

The name is derived from the Province of Dacia, now in Rumania. Dacites usually appear as subordinate members in eruptive regions where andesites are the chief rocks. They are widespread in the volcanic districts of North, Central, and South America. Quartz latites have been found in the mining districts of Globe, Arizona; Tonopah, Nevada; and elsewhere.

ALVIN S. COHAN,
Editor, "Journal of Metals."

DACOITS, dā-koitz' (Hindustani *dakait*), originally, members of a robber band in Bengal, India. Dacoity came to be the term used in India to describe crimes committed by bands of 5 or more members, and the word *dacoit* itself acquired a special sense when it was applied to members of the armed bands conducting guerrilla warfare in Burma following the 1885 defeat of King Thebaw. Dacoits reappeared in significant numbers in the late 1940's, when social unrest accompanied the transition from colonial to independent status. The term has also been used to describe the outlaws of Thailand.

DA COSTA, dā kōs'tā, Izaak, Dutch poet and theologian: b. Amsterdam, Netherlands, Jan. 14, 1798; d. there, April 28, 1860. After studying at Amsterdam he went to Leiden, and received there in 1818 a doctor's degree in law and in 1821 a doctor's degree in literature. His father was a Portuguese Jew, but he himself became a Christian in 1822. Willem Bilderdijk was an impor-

tant influence on him. He wrote poetry and historical and theological treatises, and translated plays by Aeschylus; in later years he served as a director of the seminary founded in Amsterdam by the Free Church of Scotland. He was important less, perhaps, for his contribution to art than for the part he played in the Revival of Religion. In *Bezwaren tegen den geest der eeuw* (1823) he attacked the principles made current by the French Revolution. His poetry included *Poëzy* (1821-1822), a two-volume collection of his early work; *Vijfen-twintig jaren* (1840), dealing with the main events of the period 1815-1840; *Hagar* (1840), in which Hagar represents Islam; *Wachter, wat is er van den nacht?* (1848), predicting the revolution of 1848; and *De Slag bij Nieuwpoort* (1859), recounting the defeat of the Spaniards by Maurice of Nassau in 1600.

DA COSTA, Jacob Mendez, American physician: b. Saint Thomas Island, West Indies, Feb. 7, 1833; d. Villanova, Pa., Sept. 11, 1900. His family moved to Europe when he was four years old, and he received his early education at Dresden and other places in Europe. He graduated from Jefferson Medical College, at Philadelphia, Pa., in 1852. After further study in Paris, Prague, and Vienna, he returned to Philadelphia in 1853, began practice, and undertook the giving of medical courses which were especially valuable because of his knowledge of the latest methods of physical diagnosis. He was the first secretary of the Pathological Society of Philadelphia, which he helped to found in 1857. From 1872 until 1891 he was professor of medicine at the Jefferson Medical College, and there established himself as a foremost teacher and clinician. He served as president of the College of Physicians of Philadelphia during the years 1884-1886 and again during the period 1895-1898. An original member of the Association of American Physicians, he was its president in 1897. His *Medical Diagnosis* (1864; 9th ed. 1900), translated into several languages, had an important influence in systematizing medical diagnosis. Among his other books was *Harvey and His Discovery* (1879). After studying Civil War soldiers he gave an early description of irritable heart, a condition which was called, after him, Da Costa's syndrome and, later, neurocirculatory asthenia. The subject matter of his medical papers also included typhoid fever.

DACRON, dā'krōn, the trade name used in the United States for the synthetic polyester fiber produced from terephthalic acid and ethylene glycol. Made by the E. I. du Pont de Nemours & Co., Inc., it is used for clothing and sewing thread and for industrial implements such as high-pressure fire hose and transmission belts. Textiles made from the fiber are wrinkle- and water-resistant, but have several limitations, including that of glazing when ironed at normal pressing temperatures. Dacron has often been blended with other materials. In 1951 estimated production of the fiber was 3 million pounds, but in 1953 production rose to an estimated 35 million pounds. The English name is terylene.

DACTYDIUM, a genus of about 20 species of evergreen coniferous trees and shrubs, natives of New Zealand, Australia, Tasmania, Borneo, the Pacific Islands, and Chile, belonging to the Podocarpus family (Podocarpaceae). The leaves

of young trees or on lower branches of older ones are linear or awl-shaped, whereas those of adult trees are small, scalelike, and closely overlapping. The trees are mostly dioecious, rarely monoecious. The name is derived from the Greek word *dakra* (tear), alluding to the resinous exudation of the wood. The wood is yellow or reddish in color, sometimes handsomely figured, normally very resinous, but durable. It is used for building purposes and for furniture. Rimu or red pine (*D. cupressinum*), a tall tree reaching 100 feet, is abundant in New Zealand and is an important lumber tree. Huon pine (*D. franklinii*), an equally tall tree of Tasmania, is one of the best known trees of the island and is famous for its finely marked wood. Introduced in the early 19th century, some species are rather tender ornamentals in northern countries. Fossil shoots, seeds, and pollen grains of Tertiary age have recently been described from various horizons in New Guinea, Australia, and Tasmania.

THEODOR JUST.

DACRYOCYSTITIS, dāk-rī-ō-sis-tī'tis, an inflammation of the tear sac. It may become purulent, much inflamed, swollen, and painful.

DACTYL, dāk'til, in Greek and Roman versification, a foot consisting of one long followed by two short syllables. In the following line, for example,

Tityre | tu patu | lae recu | bans sub | tegmine | fagi,
the first, second, third, and fifth feet are dactyls. In modern English verse a dactyl is represented by one accented and two unaccented syllables. The word is derived from the Greek *daktylos*, a finger—a finger has one long and two short joints. See VERSIFICATION.

DACTYLIOMANCY (Greek *daktylios*, a ring, and *mantia*, divination), the pretended art of divining by means of finger rings.

DACTYLIS, ORCHARD GRASS, or **COCKSFOOT**, is a perennial grass naturalized from Europe, North Africa, and Asia, and characterized by flat leaves and glomerate, one-sided panicles. The term "dactylis" (Greek *daktylos*, finger) was first used by Pliny for a grass with finger-like stiff spikes. *D. glomerata*, the common orchard grass, is the only species of this genus. It grows in dry soils in fields, waste places, and along roadsides, and is widely cultivated in England—where it is known as cocksfoot—and elsewhere as a meadow and pasture grass. It is suitable for early pasture, as it flowers in June, and is an excellent source of hay. A variegated horticultural form (var. *variegata*) is occasionally cultivated for borders. See GRASSES IN THE UNITED STATES—Orchard Grass (*Dactylis glomerata*).

THEODOR JUST

DACTYLITIS, etymologically, an inflammation of the finger, but generally restricted to an osteomyelitis of the phalanges or metatarsal or metacarpal bones. This may be either tuberculous or syphilitic. In tuberculous form the bone slowly enlarges, the skin becomes reddish, softening takes place, and pus is discharged through a short cavity which leads to dead bone. In its treatment care should be paid to the general condition of the patient. General upbuilding, by cod-liver oil and other

tonics, is necessary. Surgical procedures may be imperative. In the syphilitic form, which usually affects infants, there is as a rule a gummatous deposit in the bones. It resembles the tuberculous forms, but responds to treatment by means of potassium iodide.

DADAISM (Fr. *dada*, hobby horse), an artistic movement begun in Zurich in 1916 as a protest against the folly of war and against the civilization that engendered it. Its scope was enlarged, as it spread to Berlin, Paris, and New York, to express disgust with all that was conventional and sacrosanct by portraying deliberately inane objects as art of the highest order. The school was well represented by such artists as Man Ray, Max Ernst, Marcel Duchamp, and Hans Arp, and succeeded in developing psychological, aesthetic, and technical experiments through its encouragement of uncensored spontaneity, thereby allowing a multitude of new forms to appear in the artistic world which eventually found their milieu in the more guided application of surrealism. The movement faded out in 1922 and many Dadaists became surrealists.

DADDY-LONG-LEGS, a name generally applied to the family Phalangidae of the order Arachnida. Like true spiders they have four pairs of legs but they differ in having the abdomen distinctly segmented. The head and thorax are united, forming the cephalothorax. The legs are usually very long and slender and loosely attached to the thorax, so that they become disjointed by the slightest pull. But the insects are able to survive and reproduce with only three or four legs. In the kinds with the longest legs the tarsi may have annular constrictions which make them appear to have as many as 50 segments. Daddy-long-legs often congregate in enormous numbers on the trunks of trees or on shrubs. At these times they give off an unpleasant odor which undoubtedly protects them from would-be predators.

DADE CITY, city, Florida, seat of Pasco County, altitude 228 feet, 35 miles northeast of Tampa, served by the Seaboard Air Line and Atlantic Coast Line railroads and state and federal highways. In an extensive citrus fruit, cattle, and poultry-raising region, it is the site of one of the largest citrus fruit packing plants in the United States. The St. Leo Preparatory College (Roman Catholic; men) is six miles west of the city. Originally called Fort Wade, the town was incorporated in 1889 under its present name. Pop. (1950) 3,806.

DADO, dā'dō, an architectural term for the middle part of a pedestal, that is to say, the solid rectangular part between the plinth and the cornice, also called the die. In the interior of houses the term is applied to a skirting of wood several feet high around the lower part of the walls, or an imitation of this in wallpaper.

DAEDALUS, dēd'ā-lūs, mythical Greek craftsman and inventor, the scene of most of whose labors is placed in Crete. According to the common accounts, Daedalus lived some time before the Trojan War, was distinguished for his talents in architecture, sculpture, and engraving, and as the inventor of many instruments, namely the axe, saw, plummet, and auger, as well

as glue, masts, and yards for ships. As a sculptor he wrought mostly in wood, and was the first who made his statues with feet apart and eyes open. He built the famous labyrinth for the Minotaur in Crete; designed the thread for Ariadne; and executed for Pasiphaë the notorious wooden cow. Being imprisoned with his son Icarus by Minos, king of Crete, he invented wings for flying. The wings were fastened on with wax and, while escaping to Sicily, Icarus flew so high that the heat of the sun melted the wax and the wings dropped off, leaving him to fall into the sea, whence the Icarian Sea is said to have received its name. Daedalus himself reached Sicily, and Minos, who had followed him seeking revenge, was killed by the daughters of the Sicilian king.

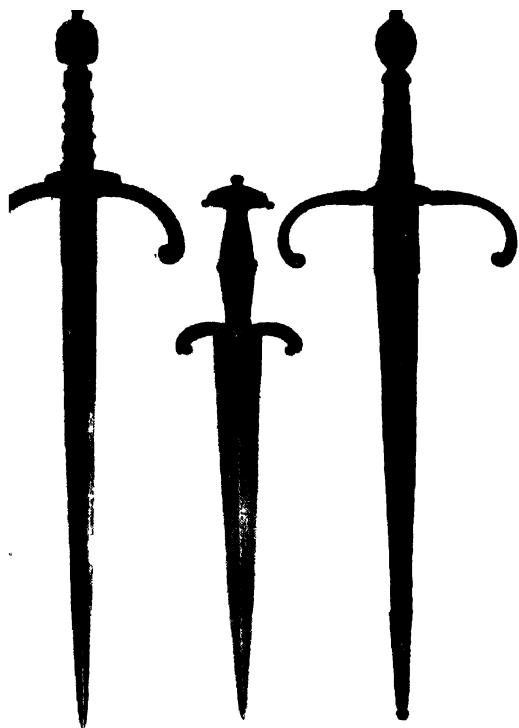
Mythologists suppose that Daedalus is not really a proper name but the common symbol of all the first architects, metallurgists, and sculptors in Grecian antiquity who worked principally with wood.

DAEDALUS OF SICYON, Greek sculptor, who lived about 400 B.C. He is said to have been the pupil, and some authorities say the son, of Patrocles. The trophy or stack of armor erected at Olympia, in remembrance of the victory over the Lacedaemonians, was attributed to Daedalus.

DAEMONELIX, dē-mōn'ē-līks, a scientific name provisionally given to an extraordinary formation apparently fossiliferous, extending over a large area in northwestern Nebraska and eastern Wyoming. The soft sandstone of this region has undergone excessive erosion, leaving fantastic figures, some of them 40 feet high. The objects to which the term is especially applied are of various shapes, including gigantic pillars, lower cakelike forms, and columns appearing like fingers and cigars. Those particularly exciting scientific inquiry are spiral and twisted, giving rise to the local name "devil's corkscrews." These in some cases resemble huge hop poles with circling vines running up spirally, or screws with exactly cut threads. In other cases the corkscrew is closely imitated, leaving the spiral without the central pole. They penetrate the fossil bones found in the same beds. So far as the tests have gone, the composing material is found to contain cellular, nonvascular, parenchymatous tissue—a fiber distinguishing it from its stony matrix, and not to be referred to animal but rather to plant origin, and pointing to an alga. It has been suggested that they are merely well-preserved rodent burrows.

DAENDELS, dān'dēls, **Herman Willem**, Dutch soldier and statesman: b. Hattem, Gelderland, Oct. 21, 1762; d. Elmina, Gold Coast, Africa, May 2, 1818. He took part in revolutionary disturbances in Holland in 1787, and was in consequence compelled to seek refuge in France. In the campaign of 1793 he rendered important service to Charles François Dumouriez, and was elevated to the rank of a general of brigade. In 1796 he was made lieutenant general of the newly created Batavian Republic where he maintained one of the last strongholds against the Anglo-Russian invasion. In 1806 he took service under the king of Holland, and from 1807 to 1811 he was governor general of the Dutch East Indies, publishing a record of his work there in 1814. On

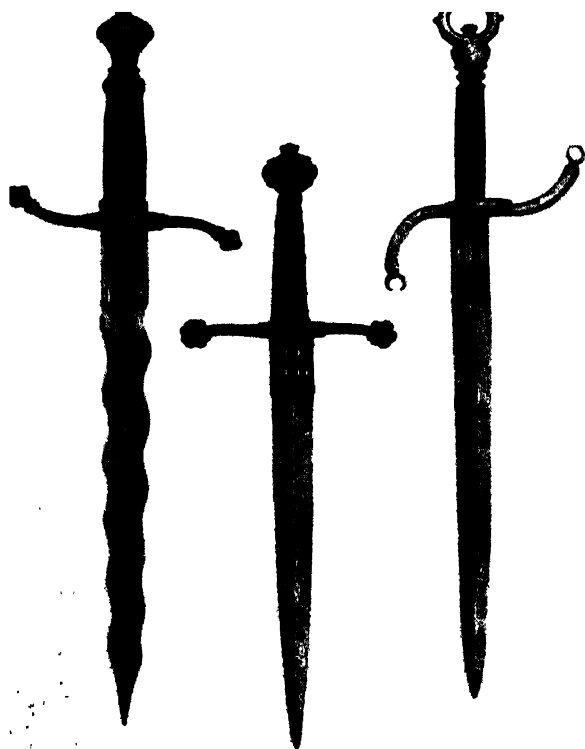
AGGERS



oignards. French—English—French. 16th century.



Basilard type dagger. Swiss. 14th century
Cross-hilted dagger English 14th century.

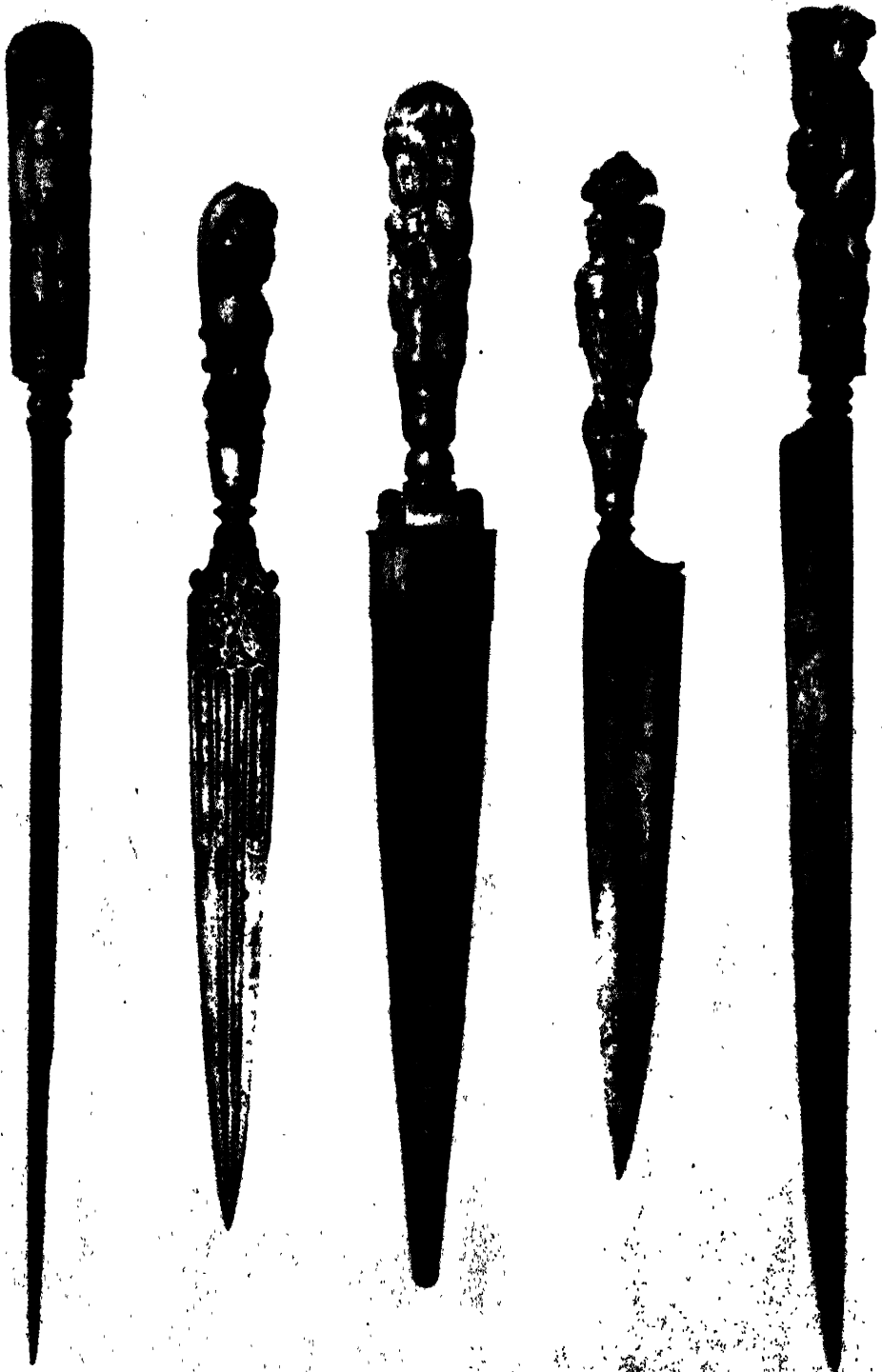


Poignards. German—French—Italian. 14th-17th century.

Kidney dagger. Saxon, 16th century.

All from the Dean Collection.

DAGGERS



Dirks. South French—Catalan—Sardinian—French—Italian. 17th-18th century.

All from the Dean Collection

the overthrow of Napoleon, the new king of Holland, William I, entrusted Daendels with the organization of the Dutch colonies on the African Gold Coast, where he died.

DAET, dá'át, municipality, Philippine Islands, capital of the province of Camarines Norte, Luzon, situated on the river Daet, four miles above its mouth, and 85 miles northwest of Legaspi. In the midst of a low-lying, humid area producing rice, abacá, bananas, coconuts, and lumber, it is the chief commercial and shipping point of the province. There are gold mines in the vicinity and the ruins of an old Spanish fort. A convent of the Franciscans was established here in the 17th century. Pop. (1948) 19,880.

DAFFODIL, dǎf'ō-dīl (corrupted from the Lat. *asphodelus*, asphodel), the English name of those species of *Narcissus* which have a large bell-shaped, yellow corona. The common daffodil, *N. pseudo-narcissus*, is a native of England and of nearly all parts of Europe and is also found extensively in the United States, growing in woods and hedges, and often cultivated in gardens. Many varieties of it are among the most esteemed of early flowers. See also NARCISSUS.

DAFOE, dǎf'ō, John Wesley, Canadian journalist: b. Combermere, Ontario, March 8, 1866; d. Winnipeg, Manitoba, Jan. 9, 1944. He was educated at Arnprior high and public schools and after serving as a schoolteacher joined the Montreal *Star* in 1883, becoming its parliamentary correspondent at Ottawa. In 1885 he accepted the editorship of the newly founded *Evening Journal* of Ottawa, and after serving with several Canadian newspapers, was, from 1901 to 1944, editor in chief of the Manitoba *Free Press*. He became chancellor of the University of Manitoba in 1934. He published *Over the Canadian Battlefields* (1919); *Laurier, a Study in Canadian Politics* (1922); *Canada, an American Nation* (1935).

DAGAMI, da-gǎ'mê, municipality, Philippine Islands, in the province of Leyte, on the Maya River, 16 miles south-southwest of Tacloban. It is in an agricultural district raising rice, coconuts, and corn, and during World War II was taken by the Americans on Oct. 29, 1944. Pop. (1948) 20,361.

DAGESTAN, dǎg-ēs-tǎn', or **DAGHESTAN** (officially DAGESTAN AUTONOMOUS SOVIET SOCIALIST REPUBLIC), autonomous republic, USSR, on the west shore of the Caspian Sea, bounded on the northwest by the Grozny Region, on the south by the Azerbaidzhan SSR and on the west by the Georgian SSR. Largely a mountainous country, traversed by the Caucasus Mountains, its 13,124 square miles are to a great extent arid; it has been only through the introduction of irrigation that agricultural development has been carried on. The main rivers are the Sulak and the Samur, and are, like the other rivers, short and unnavigable; the forests are small and infrequent, while the only level ground, near the Caspian, is mostly salt marsh or sandy plain. Cattle and sheep raising form the principal occupation of its isolated mountain tribes, and there are also fisheries along the coast and cotton milling and glassworking in the cities. There are large deposits of iron, petroleum, quicksilver, and

sulphur here but they remain comparatively unexploited.

With its many ethnic strains, chiefly of Caucasian, and nationalities (over 30, chief of which are the Lezghians), one of Dagestan's greatest difficulties has been the overcoming of language and tribal difficulties, with each tribe attempting to preserve its individuality. The capital of the republic is Makhachkala (formerly Petrovsk), the major industrial and commercial city, and other important cities are Derbent, Buinaksk, and Khasav Yurt.

History.—Inhabited from the earliest times by warlike, nomadic tribes, Dagestan was nominally under the control of Persia until 1813 when it was ceded to Russia, although the local khans succeeded in fighting off complete subjugation until 1859. When the Russian Revolution broke out in 1917, Dagestan declared itself an independent republic and from 1918 to 1921 was the scene of a bitter civil war, terminating in the latter year with its becoming an autonomous republic of the USSR. There followed several years of famine, pestilence, and plague, and in 1936 the republic was completely reorganized with a change in the boundaries. Pop. (1941 est.) 977,800.

DAGGER, dǎg'ēr, **MOTH**, a common name given to several of the species of *Apatela*, a genus of nocturnal moths which feeds upon the leaves of orchard trees and small fruits. It has gray fore wings margined with black dots and transverse lines. The caterpillar is of a velvety black and forms its cocoon by wrapping itself in leaves bound with a silken thread.

DAGGERS, short-bladed, double-edged weapons used for stabbing. Although the dagger was used as early as the days of Homer, principally as a cutting or swiping weapon, it came into general use as a stabbing weapon in Europe during the Middle Ages. Evolved from the Frankish *scramasax*, a long, single-edged, broad-bladed knife, a dagger known as the *misericord* or "dagger of mercy" came to be worn by knights as an administrator of the *coup de grâce* on the field of battle. It was a sharp, pointed dagger able to penetrate chain and plate armor and was worn at the knight's right side, usually attached by a chain to the sword belt and sometimes made doubly secure by a chain stapled on the armor itself.

Civilians of the 14th and 15th century wore a dagger called an *anlace* or *baselard*, with a longer and broader blade than the misericord; and even the gentlewomen of that time wore daggers suspended from their girdles. Other daggers of the late Middle Ages and early Renaissance were the *kidney dagger*, so called because of the two round lobes near the hilt resembling those organs; the Scottish *dirk*, a close relative to the kidney dagger, with a long, thin blade, still in use as an ornament by the Scots; the *roundel dagger*, in which the guard took the form of a disk; the *quillon dagger*, which was a shortened version of the cruciform sword; the *cinquedea dagger*, a broad-bladed, sharply-pointed Italian knife, often beautifully decorated and so called from its five-finger breadth of blade at the hilt; the *Landsknecht dagger*, a short, powerful dagger first employed by professional Swiss soldiers (*Landsknecht*); and the *car dagger*, one of an assortment of various daggers of Oriental origin

that had in common two circular ears or knobs set on an angle on the pommel.

As the double-edged sword gave way to the dueling sword in the 16th century, so the dagger changed from a weapon independent of the sword to one that became the complement of the sword. The left hand dagger, or *main gauche*, a rapier-like dagger with long quillons and elaborate knuckle guards, was developed to ward off the opponent's sword thrusts while the right hand was offensively wielding the sword. Some of these daggers had a toothed edge or a notch near the hilt on which to catch the sword and break it. However, the advent of smaller and lighter swords precluded the continuance of the dagger, save as an ornamental weapon. It was, however, used later in Latin countries and was developed into the Italian *stiletto*, a small, pointed dagger that could easily be hidden on the body.

Midshipmen of the Royal Navy still wear a ceremonial dirk as do the Scots, but the value of the dagger as a personal, close range weapon has been superseded by the derringer and the automatic pistol. For the interesting history of Eastern daggers, many of them still in use, see JAPANESE AND ORIENTAL ARMS AND ARMOR.

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ROBERT G. GULIAN,

Editorial Staff, *Encyclopedia Americana*.

DAGNAN-BOUVERET, dā-nyān' bōōvré', **Pascal Adolphe Jean**, French painter: b. Paris, Jan. 7, 1852; d. there, July 3, 1929. He was a pupil of Jean Léon Gérôme, and recipient in 1874 of the second Grand Prix de Rome. He soon broke with the style of Gérôme and showed the influence of Jules Bastien-Lepage. His picture of the death of Manon Lescaut, which took the medal of the third class at the Paris Salon of 1878, showed him to be in possession of an original and particularly individual style of painting. *Une noce chez le photographe*, exhibited in the Salon of 1879, was much admired for composition and technique. In the Salon of 1880 he displayed a much more serious form of talent. His picture, *Un accident*, which took the medal of the first class that year, remains one of his masterpieces, being greatly admired for the truth of its types and expressions. These early works ranked him among the most keen portrayals of our modern manners. *Bénédiction des jeunes époux en Franche-Comté* (1882) bore the stamp of extraordinary poetical feeling which his later paintings—illustrating, for the most part, the life, customs, and costumes of Brittany—have served to accentuate. Among his other well-known paintings are *Le pain béni*; *Les Bretonnes au Pardon*; *La Cène*.

DAGOBA, dā'gō-bā, or **DAGABA**, in Buddhist Ceylon, a massive temple building containing relics, synonymous with the Indian *tope* (q.v.). The word is said to be derived from the Sanskrit *dhātu*, a relic, and *garbha*, the womb, and eventually came to be the more modern "pagoda." They are built of brick or stone, are circular in form, and are erected on natural or artificial mounds, while the stone or brick structure itself sometimes rises to an immense height.

The contents of a dagoba usually consist of stone or metallic vessels of various shapes and sizes. These dagobas are held in the highest veneration by the Buddhists, and a common mode of testifying their veneration is to walk around them, repeating prayers. Some remarkable dagobas are to be seen at Anuradhabura, in Ceylon.

DAGOBERT I, dā'gō-bért, Merovingian king of the Franks: b. about 600; d. Epinay, Jan. 9, 639. In 628 he succeeded his father, Clotaire II, who had acquired the divided members of the Frankish Empire. Under his rule the Merovingian monarchy achieved its greatest sway. He waged war with success against the Slavonians, Gascons, and Bretons; but stained the splendor of his victories by cruelty, violence, and licentiousness. He deserves praise for his improvement of the laws of the Franks. He was buried at the abbey of Saint-Denis, which he had founded in 626.

DAGON, dā'gōn, a deity of the Philistines, whose image is generally believed to have been in the form of a triton or merman, with the upper part human and the extremities, from the waist downward, in the shape of the tail of a fish. From this latter supposition the name is derived from the Hebrew *dag*, a fish. Dagon and his temple are mentioned in Scripture, more especially in 1 Samuel 5:2-7. Another derivation takes the origin of the word from a Semitic root *dagan*, meaning corn, and thus makes the god a patron of agriculture. The same name is used for a god of Babylon. His temples were at Gaza and Ashdod and he was probably worshiped at other places than Phoenicia, as the testimony of place names and names of several kings indicate. John Milton alludes to him in describing the infernal senate in his *Paradise Lost* (q.v.).

DAGUERRE, dā-gār, **Louis Jacques Mande**, French inventor: b. Corneilles-en-Parisis, Seine-et-Oise, France, Nov. 18, 1789; d. Bry-sur-Marne, near Paris, July 10, 1851. He was trained as a scene painter, and made sets for leading theaters. In 1822 he opened, with Charles-Marie Bouton, the Diorama (q.v.), a theater without actors. A large, translucent canvas was painted on both sides. By special skylights and windows, either painting could be shown to the audience. Thus it was possible to show a landscape by sunlight or moonlight, changing seasons, a building before and after a fire, and similar tableaux. A few years before 1829, he began some photographic experiments. In 1829 he took as his partner Nicéphore Niépce, who had already worked out a photographic technique he called "heliography." After Niépce's death in 1833, Daguerre perfected a method which he named "daguerreotype," and which was presented to the Academy of Science on Jan. 7, 1839. This secret process was purchased by the French government, and working details made public on Aug. 19, 1839. As a recompense, Daguerre was awarded a pension of 6,000 francs, and his late partner's son and widow 4,000 francs. Daguerre's instruction manual, published in 1839, became a best seller and was widely translated and reprinted. He did little to improve his process. He retired to Bry-sur-Marne, where he once again took up painting. See DAGUERREOTYPE PROCESS; PHOTOGRAPHY—Evolution of the Photographic Process.

DAGUERREOTYPE PROCESS. One of the earliest methods known for fixing by chemical means the image formed in a camera, thus producing permanent pictures, or "photographs." As practiced by Daguerre (q.v.), the method consisted of making a silvered copper plate light-sensitive, exposing it in a camera, and developing the image. The plate was first brought to a high, mirror-like polish. It was then put, face down, over particles of iodine, the fumes of which reacted with the silver surface to produce light-sensitive silver iodide. The treated plate was exposed in the camera for two to 40 minutes, depending on the brilliance of the subject. After exposure the plate was developed by subjecting it to the fumes of heated mercury. Treatment by sodium thiosulphate solution (then called hyposulphite of soda) made the image permanent by removing the undeveloped silver iodide. After rinsing with water, the plate was dried and put behind glass. A daguerreotype may be recognized by the shadows, which are clear mirror areas of polished silver. They reflect a dark field, they appear dark, and the highlights stand out as whitish mercury amalgam. The details of the process were made known by the French government in 1839. Improvements over Daguerre's method were rapidly made. Less cumbersome apparatus was put on the market and lenses were ground to admit as much light as possible during exposure. Hippolyte Louis Fizeau suggested in 1840 that the tones of the daguerreotype could be enriched by treating the plate with gold chloride. This practice of "gilding" became universal. The greatest improvement was increasing the sensitivity of the plate, so that exposure could be made in seconds instead of minutes, by treating it with the vapors of bromide and chlorine, as well as iodine. Several experimenters claimed this discovery, but it is clear that the first successful use of these accelerators was made by John Frederick Goddard in London, 1840.

The daguerreotype process spread throughout the world with great speed. In America, a daguerreotype was taken by D. W. Seager as early as Sept. 16, 1839. He was immediately followed by Samuel F. B. Morse, who met Daguerre in Paris just before the process was announced. The first photographic portrait appears to have been taken in New York by Alexander S. Wolcott and John Johnson in October 1839. They used a camera of their own invention in which the lens was replaced by a concave mirror. The results were miniatures, three-eighths of an inch square. Their studio, opened in January 1840, was probably the first photographic gallery in the world. Daguerre was associated in his early work with Nicéphore Niépce, who had previously discovered the heliographic, or bitumen process (q.v.) of making photographs. Many authorities insist that Daguerre took unfair advantage of his partner. He published as his own processes for which Niépce should have had equal credit. It is true that Niépce made a heliograph or photograph as early as 1826, but it was hardly recognizable. During the eight hours required for exposure, the sun had moved, destroying the shadows. Niépce, by his own admission, had gone as far as he could alone when he joined Daguerre. Not until 1837, four years after Niépce's death, was Daguerre able to show a successful result. This first daguerreotype, now in the collection of the French Society of Photography, bears little resemblance to Niépce's work.

Daguerre gave his late partner full public credit; the French government awarded pensions to Niépce's heirs as well as to Daguerre; and the pamphlet which Daguerre wrote, *Historique et Description du Procédé Nommé le Daguerreotype* (Paris, Giroux, 1839), contains working directions for heliography as well as the daguerreotype.

BEAUMONT NEWHALL,
George Eastman House, Rochester, N. Y.

DAGUPAN, dā-gōō'pān, town, Philippines, in the Province of Pangasinan, Luzon, situated on the Lingayen River where it enters the gulf of the same name, about 130 miles northwest of Manila on the Manila and Dagupan Railroad. It is an important road center and has a large trade in sugar, rice, abaca, tobacco. It was one of the strongholds of the Filipino insurgents in the Spanish-American War and the point where most of the filibustering expeditions landed. Soon after hostilities between the United States and the insurgents opened, the American military authorities were unanimous in the opinion that Dagupan should be made a base of operations. Sufficient troops were lacking until November 1899, when an expedition under command of General Wheaton was sent there. A landing was made at Lingayen, a suburb of Dagupan, where earthworks had been constructed. The works and town were shelled. When American troops were landing, insurgents opened fire, but the landing was successfully completed and the town taken. From here the Americans continued their pursuit of Aguinaldo. During World War II there was fighting in the vicinity. Since the establishment of the Republic of the Philippines in 1946, there have been economic problems which have involved Dagupan as well as other centers. Pop. (1939) 6,323; municipality (1948) 43,838.

DAHABEAH, dā-hā-bē'ā, an Egyptian barge-like boat, the forerunner of the European and American houseboat, used on the Nile for conveyance of travelers. It varies considerably in size, has one or two masts, with a very long slanting yard on each mast supporting a triangular or lateen sail, and affords good accommodation for passengers. Seats on the fore and aft deck are used by rowers when needed. Wealthy travelers often hire one of these vessels for a trip up and down the river, the voyage to the First Cataract and back, under the most favorable circumstances, occupying seven weeks, and three weeks more if prolonged to the Second Cataract. Their use, however, has been largely superseded by pleasure steamers.

DAHL, dāl, *Andreas*, Swedish botanist: b. 1751; d. 1789. He was educated at Uppsala University, where he was a pupil of Carolus Linnaeus (Carl von Linné). The genus *Dahlia* was named for him in 1791.

DAHL, Hans, Norwegian painter: b. Hardanger, Norway, 1849; d. Berlin, Germany, 1919. Destined for the army, he studied at Christiania, but left service in 1873 to be an artist. He studied at Karlsruhe and Düsseldorf under Hans Gude, Eduard von Gebhardt, and Karl Rudolf Sohn; and then specialized in landscape and genre, painting the fishermen and mariners of Norway and life in Norwegian towns. In 1889 he settled in Berlin. His work is popular in Norway.

DAHL, däl, **Johann Christian**, Norwegian landscape painter: b. Bergen, Feb. 24, 1788; d. Dresden, Ger., Oct. 14, 1857. He studied at the Academy of Copenhagen from 1811 until 1818, when he went to Dresden, where he became professor of painting in the art academy in 1821. His works at the Dresden Gallery included *Norway* and *Storm at Sea; Kronberg by Moonlight* was hung in Schiefer Castle, near Gotha.

DAHL, Michael, Swedish portrait painter: b. Stockholm, Swed., 1656; d. London, Eng., Oct. 20, 1743. From 1688 he made his home in England, where he became one of the most fashionable painters of prominent persons. His portrait of Princess Anne (who later ascended the throne) and her son is in the National Portrait Gallery, London, and that of Charles XI of Sweden at Windsor Castle. He also painted a series of portraits of naval officers for Greenwich Hospital (q.v.); and a series of ladies of the court for Petworth Park.

DAHL or **DAL**, **Vladimir Ivanovich**, Russian physician and writer: b. Lugansk (later Voroshilovgrad), Ukraine, 1801; d. Moscow, Russ., Nov. 3, 1872. As a military surgeon he took part in the Turkish and Polish campaigns of 1828-1831. For some years he served on the staff of the governor general at Orenburg (Chkalov), and he accompanied the expedition to Khiva in 1839. Subsequently he toured many parts of the Russian Empire, collecting much ethnological data and folklore. Besides numerous works on botany, zoology, and biology, he published an *Explanatory Dictionary of the Living Russian Languages*, 4 vols. (1861-1868).

DAHLAK ARCHIPELAGO, däl'lāk, an island group in the Red Sea, off the Bay of Massaua, politically part of Eritrea. Dahlak, largest of the islands (which aggregate 450 square miles), has a length of 23 miles and breadth of 15 miles. Since Roman times the archipelago has been famous for its pearl and sponge fisheries. Pop. 2,000.

DAHLBERG or **DAHLBERGH**, däl'bär-y', **COUNT Erik Jönsson**, Swedish military engineer: b. Stockholm, Swed., Oct. 20, 1625; d. there, Jan. 26, 1703. In the winter of 1656-1657, during the war with Denmark, he led Swedish troops across the frozen sea to the Danish islands. He was director general of fortifications from 1676 until his retirement in 1702, establishing a reputation which earned him the title of "Vauban of Sweden."

DAHLGREN, däl'grän, **Fredrik August**, Swedish poet and dramatist: b. Nordmark, Swed., Sept. 20, 1816; d. Feb. 2, 1895. Collections of his dialect songs and ballads were published in three volumes in 1876. Most successful of his dramas was *Vermålingarne* (1846).

DAHLGREN, däl'grän, **John Adolphus Bernard**, United States naval officer: b. Philadelphia, Pa., Nov. 13, 1809; d. Washington, D.C., July 12, 1870. In 1826, he entered the navy of the United States as a midshipman, in 1837 was advanced to the rank of lieutenant and, in 1855, to that of commander. From the year 1847, he was employed on ordnance duty. He invented in 1851 a new 11-inch gun named for him, and

he devised a method of arming gunboats with howitzers for throwing canister shot and shrapnel shells. At the outbreak of the American Civil War he was commander of the naval station at Washington; in July 1862, he was given command of the South Atlantic squadron; and after the death of Admiral Andrew Hull Foote (q.v.) in 1863 was appointed rear admiral of the fleet stationed before Charleston. He led a successful expedition up the Saint John's River in 1864, and assisted Sherman in the capture of Savannah; and in 1866 he was given command of the South Pacific squadron. He served as chief of the ordnance bureau 1868-1870, and, just before his death, was placed in charge of the navy yard at Washington, D.C. His professional writings included *System of Boat Armament in the United States Navy* (1852); *Shells and Shell Guns* (1856). A memoir of him was published in Boston by his widow, Sarah Madeleine Vinton Dahlgren (q.v.), in 1882.

DAHLGREN, däl'grän, **Karl Fredrik**, Swedish poet and humorist: b. Stensbruk, Östergötland, Swed., June 20, 1791; d. Stockholm, Swed., May 1, 1844. A clergyman, from 1829 he occupied an ecclesiastical post in Stockholm, for a number of years he was also a member of Parliament. He excelled in descriptions of nature and in the idyllic burlesque. For years he published a *Muses' Almanac*, containing his stories and comic sketches. His novel *Nahum Fredrik Bergström's Krönika* (1831), a work of distinguished merit, was partially autobiographical. His last book, *Ångbåts-Sånger* (*Steamboat Songs*), was published in 1837.

DAHLGREN, däl'grän, **Sarah Madeleine Vinton**, American author: b. Gallipolis, Ohio, July 13, 1825; d. Washington, D.C., May 28, 1898. She was the wife of John Adolphus Bernard Dahlgren (q.v.). In addition to publishing a memoir of him in 1882, she wrote numerous novels and books of travel, which included *South Sea Sketches* (1881) and *Lights and Shadows of a Life* (1886).

DAHLIA, a genus of perennial herbs of the family Asteraceae, closely related to the genera *Bidens*, *Coreopsis*, and *Cosmos* (q.v.), which are distinguished by technical characters. Indeed, *Cosmos diversifolius*, or black cosmos, is well known to gardeners in the United States as *Bidens* and *Dahlia*. The true dahlias are much confused as to nomenclature, only about 10 well-authenticated species being recognized out of a large number of synonyms. With few exceptions (Central American species) they are natives of Mexico. Six species are cultivated, but only two of these (*D. rosea* and *D. juarezii*) are of wide horticultural importance.

There are many double and single varieties. Considering the short time the dahlias have been in cultivation (since 1879) they have attained a very high rank as a garden plant, being numbered among a dozen plants to have special societies and exhibitions, both in Europe and America. Besides the cactus forms, which are less formal than the earlier double varieties, there are many forms and sizes ranging in color from white to yellow and deep red, but deficient in the shades of blue. The plants may be propagated by seeds for obtaining new varieties, by division of the underground parts, or

commercially by cuttings. They succeed well in almost any good soil, the tubers or the young plants being set in beds as soon as danger from frost is past. When frost has killed the tops in the autumn the plants are dug and the tubers stored in a cool, dry cellar until spring, or until they are needed for obtaining cuttings, when they are placed on greenhouse benches and forced. Few pests attack the plants.

DAHLIN. See **INULIN.**

DAHLMANN, däl'män, **Friedrich Christoph**, German historian: b. Wismar, May 13, 1785; d. Bonn, Prussia, Dec. 5, 1860. He studied at Copenhagen and Halle. In 1812 he was appointed professor extraordinary of history at Kiel, and in 1829 he accepted a call to fill the chair of political science in the University of Göttingen. There he continued his historical studies, but did not on that account altogether abandon the domain of politics. He contributed in great measure to the establishment of the constitution of Hanover in 1833, and was a vigorous advocate of liberal principles. In 1842 he was appointed to the chair of history in the University of Bonn, where he gave himself up entirely to literary pursuits. The revolution of 1848 recalled him to public life. He was sent as a deputy to the Diet of the confederation, had a share in elaborating the constitution called that of the "Seventeen," and became one of the chiefs of the constitutional or parliamentary party. He was afterward a member of the Prussian Chamber of Deputies, in which he set himself to withstand the reactionary movement which followed the troubled period of 1848-1849; but finally he renounced politics entirely, and devoted the remainder of his life to literature. He left a large number of works, all characterized by great depth, an accurate understanding of the events he relates, and a thorough knowledge of men. Among these are his *Quellenkunde der deutschen Geschichte* (1830; 7th ed. 1906); *Geschichte von Danemark* (1840-1843); *Geschichte der englischen Revolution* (1844); and *Geschichte der französischen Revolution* (1845).

DAHLONEGA, dà-lôn'è-gà, incorporated city, Georgia, seat of Lumpkin County, altitude 1,520 feet, on a branch of the Chattahoochee River, among the foothills south of the Blue Ridge Mountains. It is on a federal and a state highway; the nearest railroad station is Gainesville. The town has logging and lumbering industries, and gold is mined. The government is administered by a mayor and council. The city owns its water and sewer systems. It has high school and college libraries. It is the seat of the North Georgia College, a branch of the state university system. The town was settled in 1833; the courthouse dates back to 1836. Prior to the American Civil War, a branch mint was located here. The name is a Cherokee Indian word meaning "yellow metal." Pop. (1930) 905; (1940) 1,294; (1950 prelim.) 2,147.

DAHLSTIERNA, däl'shâr-nà, **Gunno** (original surname **EURELIUS**), Swedish author of patriotic verse: b. Öhr, Dalsland, Sept. 7, 1661; d. Pomerania, Sept. 7, 1709. His father was a clergyman. He was educated at the University of Uppsala, and after graduating in 1677 became a land surveyor. In 1681 he went to Livonia,

then subject to Sweden, and in 1687 he was offered, but declined, a professorship at the University of Leipzig. He was appointed head of the Swedish government's land department in 1699. During his long journeys in Sweden, Livonia, and Pomerania he composed the patriotic poems on which his fame rests. His versatility as surveyor, cartographer, and poet earned him a title of nobility as Dahlstierna in 1702. His *Kungaskald* (Stettin 1697) was a melodious elegy on the death of King Charles XI; and even more popular was the spirited ballad *The Goth's Battle Song, concerning the King and Master Peter* (Stockholm 1701).

DAHN, dân, **Felix** (in full **JULIUS SOPHUS FELIX**), German historian, legal scholar, and poet: b. Hamburg, Feb. 9, 1834; d. Breslau, Jan. 3, 1912. Between 1849 and 1853 he studied law and philosophy at the universities of Munich and Berlin, and in 1857 he was appointed docent in German law at Munich. He became professor extraordinary there in 1862, and the following year he accepted a professorship in law at Würzburg. In 1872 he removed to Königsberg, and in 1888 to the University of Breslau; in 1895 he was made rector at Breslau. His historical works include *Die Könige der Germanen*, 20 vols. (Munich 1861-1912); *Urgeschichte der germanischen und romanischen Völker*, 4 vols. (1881-1890). He also wrote *Das Kriegerrecht* (1870); *Handelsrechtliche Vorträge* (1875); *Deutsches Privatrecht* (1878); *Die Vernunft im Recht* (1879); *Die Landnot der Germanen* (1889), all in law and jurisprudence. In poetry, he published *Markgraf Rüdiger von Bechelaren* (1875) and *Die Staatskunst der Frauen* (1877). His fictional works included *Ein Kampf um Rom*, 4 vols. (1876); *Odins Trost* (1880); *Felicitas* (1883); *Fredigundis* (1885); *Attila* (1888); *Stilicho* (1900); *Sigewalt und Sigridh* (1898); *Herzog Ernst von Schwaben* (1902); and *Die Germanen* (1905). A collection of his literary works appeared in 21 vols. (1898 and 1901).

DAHOMEY, dà-hō'mī, a territory of French West Africa, bounded on the north by the upper Volta, on the east by Nigeria, on the south by the Gulf of Guinea, and on the west by Togo. The area is 44,710 square miles, making it the smallest of the territories of French West Africa. Besides Dahoman Negroes, there are numerous Yoruba and Bariha tribes and lesser numbers of Fulas and Hausas. Porto-Novo, the capital of Dahomey, is a seaport town on a coastal lagoon. Other towns include Cotonou (Kotonu), the former capital and likewise a port; Ouidah (Whidah or Wida), 23 miles west of Cotonou; and Abomey, 60 miles north of Ouidah, a former center for slave trading.

The coastline, which is only about 70 miles in length, consists of a line of lagoons protected from the sea by a low, sandy bar. Behind the lagoons the surface is flat and covered with dense vegetation for a distance of some 50 miles; this is succeeded by a marsh some 6 to 9 miles in width; and the hinterland north of the marsh consists of vast undulating plains rising gradually to a height of about 1,650 feet and then descending into the basin of the Niger River. The climate is very hot and moist near the coast, averaging about 80°F. The harmattan or long dry season is followed by the great rains which last for four months. The rivers of Dahomey

are relatively short and of small importance. The scanty forests contain the baobab, oil palms, and coconut palms. The soil is extremely fertile. Coffee, corn, and cotton are of economic importance, and other cultivation includes beans, peas, cassava, yams, sweet potatoes, sugar, and many tropical fruits. The principal exports are palm oil and palm kernels. Horses thrive in the interior; there are limited numbers of cattle, sheep, and goats. Textiles, metalwork, and beverages are the chief imports into Dahomey.

There are several lines of meter-gauge railroad. From an iron pier at the port of Cotonou a railroad extends into the hinterland as far as Parakou, a distance of 257 miles, and a branch line of 36 miles gives rail access to Ouidah and Segborué, on Lake Ahémé. From Porto-Novo, the capital, is a railroad to Pobé, on the Nigerian frontier, a distance of 50 miles; and a line of 22 miles completed in 1930 links Porto-Novo with Cotonou. Tchaourou was connected with Parakou in 1935 by a railroad 35 miles in length. The seaport of Grand Popo is on a coastal railroad between Porto-Novo and Lakossa, on the frontier of Togo. Highways aggregate more than 2,700 miles, of which 871 miles consist of first class roads. The East Road, suitable for motor transport, extends from Savé to Malanville, on the Niger, a distance of 297 miles; and the Northwest Road, 281 miles in length, connects Tchaourou with Porga. Among other main highways are Cotonou-Dassa-Zoumé-Savé (198 miles), Cotonou to Anecho (68 miles), Abomey to Ketou (75 miles), and Tchaourou to Djougou (93 miles). The territory is represented in the National Assembly by 1 deputy, in the Council of the Republic by 2 senators, and in the French Union Assembly by 2 members.

History.—Previous to the French occupation, Dahomey was an absolute monarchy. The Dahomans, who speak a dialect of the Ewe language, are tall, long-headed Negroes. In their own tongue, Dahomans are called Fon. Under the native kings there was a standing army estimated to number 15,000, a large proportion of the warriors being women distinguished by superior physique and high skill in the use of weapons. During the 17th century there were three kingdoms in the territory, named Allada, Porto-Novo, and Dahomey. The last, which rose around the town of Abomey as a nucleus, conquered the other two early in the 18th century, and by successive attacks kings of Dahomey extended their rule to the highlands of the Mahé on the north and to the Slave Coast on the south. There they came into contact with Europeans and succeeded in obtaining control of a large part of the slave trade, which was then actively carried on by the English, the French, and Portuguese. With the cessation of the slave trade in the first half of the 19th century the prosperity of the country came to an end. France signed a commercial treaty with the king of Dahomey in 1851, and between 1878 and 1885 it obtained possession of Cotonou, Porto-Novo, and Grand Popo. Behanzin, who became king in 1889, was forced in 1890 to acknowledge French title to the coast region in return for an annual pension, but fighting broke out again in 1892 as a result of slave raiding by the king. With his troops completely defeated, Behanzin set fire to Abomey before its capture by the French and fled northward, but he surrendered in January 1894. The king was exiled to Fort-

de-France, Martinique, and the whole of his country was annexed by France, becoming a colony and, in 1895, being incorporated into French West Africa. The French then actively engaged in extending their authority northward as far as the Niger, and the rivalry over spheres of influence with Germany and Great Britain was settled by the conclusion of boundary treaties in 1897 and 1898, respectively. With constitution of the French Union (q.v.) in 1946, Dahomey became an overseas territory. Pop (est. 1948) 1,505,000. See also FRENCH WEST AFRICA.

DAIBUTSU, di-boōt'sōō, the name given in Japan to a gigantic statue of Buddha. The largest Daibutsu in the empire is found at Nara. It is 53 feet high and supposed to date from the 8th century. The image is shrined in a pagoda. At Kamakura is a bronze Daibutsu over 50 feet in height and 98 feet in circumference. The eyes, which are four feet long, are made of gold. See also BUDDHA.

DAIGO II or **GO-DAIGO**, gō-dī-gō, Japanese emperor: b. 1287; d. 1339. Coming to the throne in 1318, he threw off the domination of the abdicated emperors in 1322, then plotted against the Hojo regency. Captured and exiled during a civil war, he was restored in 1333. Yet the feudal lords held the real power; one of them, Ashikaga Takauji, expelled him from Kyoto, replacing him with Emperor Komyo. Daigo established a "southern" court at Yoshino, and from 1336 for 57 years two lines of emperors ruled Japan.

DAIL EIREANN. See IRELAND, REPUBLIC OF.—*History.*

DAILLE, dā-yā', **Jean**, French Protestant theologian: b. Châtellerault, Jan. 16, 1594; d. Charenton, near Paris, April 15, 1670. He became pastor in 1625 of the church at Saumur, and in 1626 of that of Charenton, where he passed the remainder of his life. He was one of the ablest and most learned divines of his day, and did essential service to the Protestant cause by several works, among which the most celebrated is entitled *Traité de l'emploi des SS Pères pour le jugement des différends de la religion* (1632). It was also published in Latin and translated into English, and in both forms has had a very extensive circulation both in England and on the continent. It aims to show that the authority of the fathers has been far too much overvalued, and that the ignorance or inaccuracy apparent in almost all their works unfit them for the establishment of any doctrine not clearly laid down in Scripture. He also wrote distinct treatises on several of the leading points of controversy between Protestants and Roman Catholics. He was an intimate friend of the celebrated Protestant leader Philippe de Mornay (Duplessis-Mornay, 1549-1623), whose grandsons he tutored, traveling with them in Italy, Germany, Holland, and England (1612-1621). Daille edited and published the *Mémoires* of his patron, and wrote *les Dernières heures de Mornay* (1624).

DAIMIEL, dī-myél', town, Spain, in Ciudad Real Province, 19 miles east-northeast of the provincial capital of Ciudad Real. The principal

buildings are the Gothic and Doric parish churches. The surrounding country produces grapes, olives, and cereals. Olive oil, wines, liquors, and woolen goods are manufactured. Pop. (1940) 19,277.

DAIMLER, dīm'lēr, Anglicized dām'lēr, **Gottlieb**, German automobile pioneer: b. Schorndorf, Württemberg, March 17, 1834; d. Cannstatt, Germany, March 6, 1900. After receiving a technical education at Stuttgart, Daimler worked under Nikolaus August Otto from 1872 to 1882 on the development of the four-cycle Otto gas engine, but in 1883 he and Wilhelm Maybach established their own shop at Cannstatt. Daimler developed hot-tube ignition and greatly lightened the four-cycle gas engine, achieving speeds of 800 to 1,000 revolutions per minute. This engine was applied to a motor bicycle, but by 1885 Daimler had developed a method of gasifying liquid fuel and in 1887 he successfully ran a gasoline motor carriage. The Daimler Motor Company, which produced the Mercedes automobile, was founded at Cannstatt in 1890. Maybach became its technical director in 1895. See also INTERNAL-COMBUSTION ENGINE—*History*.

DAINGERFIELD, dān'jēr-fēld, **Elliott**, American religious and landscape painter: b. Harpers Ferry, Va. (now W. Va.), March 26, 1859; d. New York, N. Y. Oct. 22, 1932. He studied drawing and painting in New York and later maintained his studio there. Daingerfield's paintings of religious subjects are notable for the use of deep, glowing color. His landscapes show the influence of his close friend George Inness. His noted mural decorations for the Lady Chapel of the Church of St. Mary the Virgin in New York City were commissioned in 1902.

DAIREN, dī'rēn' (Japanese form of the name; Chinese TALIAN, dā'lē-ēn'; Russian DALNY, dāl'y-nyī), port on the southern coast of Liaotung Peninsula in southern Manchuria, 20 miles east of Port Arthur. Part of China before 1898, in that year the site was leased to Russia as part of the Kwantung Territory and it has since been under Russia, 1898–1905, and Japan, 1905–1945 (see KWANTUNG). Dairen has one of the finest harbors of eastern Asia, and before World War II it was second only to Shanghai in volume of trade.

Originally a small fishing village, the city was laid out by the Russians as a commercial terminus of the Trans-Siberian Railway system, and its development was continued by the Japanese, who made Dairen a free port in 1906. It is a fine modern city, with modern utilities, and is connected by rail with Mukden and the railroads of eastern China. Exports include soy products (beans, oil, and cake), grains, coal, salt, and fish. Imports include cotton and woolen goods, metals, petroleum fuels, and machinery. Dairen is a leading soybean-processing center and manufactures cement, glass, ceramics, chemicals, and foundry products. Pop. (1947 est.) 543,690.

DAIRY INDUSTRY. Milk, more than any other single food, furnishes the nutrients needed for adequate nourishment and good health by people of all ages. It contains a generous supply of fat, proteins, sugar, minerals, and vitamins. Every 100 pounds contains about 87 pounds of water and 13 pounds of solid food material. This

is less water and more solid food than is often found in so-called solid foods like cabbage, carrots, lettuce, tomatoes, and fruits of various kinds. About two thirds of the solids of milk consist of fat and sugar, which are sources of energy. The sugar also favors the growth of desirable bacteria in the intestines and makes conditions unfavorable for putrefactive bacteria. The proteins of milk—casein and lactalbumin—are superior to vegetable proteins for building muscles, body tissues, and fluids.

Milk has no equal as a source of the calcium needed for building strong bones and teeth, and is also one of the best protective foods, because of its vitamins. It is an excellent source of vitamins A and B₂ (riboflavin), and supplies worthwhile amounts of several others. Riboflavin and calcium are two nutritional substances often lacking in the average diet, and both of them are readily obtainable from milk. Nutritionists recommend one quart of milk a day (or its equivalent in other dairy products) for every child, one quart for every pregnant or nursing woman, and one pint a day for every other adult.

The dairy industry is usually thought of as having two principal parts: dairy farming or milk production; and the manufacture and distribution of dairy products for human food. (For the latter see DAIRY PRODUCTS; MILK.)

Size and Importance of the Industry.—Dairy farming has long been looked upon as the balance wheel of the agricultural industry. The great purpose of agriculture is, of course, to provide food. But much of the land is suitable only for growing rough feeds, such as pasture grasses, hay, and other rough crops that cannot be eaten by people. Livestock, therefore, is the only agency available to mankind for turning these rough feeds into human food, and the dairy cow does this with the greatest efficiency. For a given amount of feed, she returns three times as much digestible protein as the steer, and more than twice as much food energy in edible products. She leaves more fertility on the farm, because the sale of her milk carries off less plant food in it than is contained in the body of the steer, hog, or other meat animal when it is sold off the farm. Moreover, the growing of pasture grasses, hay crops, and other roughages that are the natural feeds of the dairy cow, is an approved practice for preventing soil erosion.

Year-round Labor and Income.—Dairy farming is also a more efficient means of using labor than those farm enterprises which are seasonal in character. It is a year-round business and provides steady employment for hired labor. Furthermore, it is a regular source of cash income throughout the year. There is always a market for milk and cream. Many farmers, who keep cattle primarily for beef production, frequently turn some of the cows to milking when it is more profitable to produce milk than beef.

The price of dairy products is usually more uniform from year to year than the prices of many other farm products. While at times this may limit profits, it also eliminates great losses. Dairy farming, therefore, is a stable type of farming. When dairy cows have ceased their usefulness for milk production, or when, for economic reasons, there is need to dispose of some cows in the herd, they can be sold for meat.

Some 10 or 12 million male calves are born in dairy herds each year and only a few of them are needed for breeding purposes. The rest are sold

at early ages for veal, thus adding to the dairy farmers' income and making a sizable contribution to the nation's meat supply.

There are around 6 million farms in the United States and on nearly 80 per cent of them one or more cows are milked. The total number of cows milked in the United States has been increasing steadily for many years, keeping pace in the main with the growth of the population. The number was close to 26 million in 1944, which means 1 cow for about every 5 people in the United States.

Gross Income from Milk.—The gross farm income from milk production, which includes the cash income from sales of milk and milk products, as well as the value of all dairy products used on the farms where the milk is produced, first reached a total of 2 billion dollars in 1925. From 1930 to 1940, during which there were several years of drought and general economic depression, the total ranged from a low of 1.2 billion dollars in 1933, to a high of 1.8 billion in 1940. With the coming of wartime demands, dairy farmers received a total of 2.3 billion dollars in 1941, 2.7 billion in 1942, 3.3 billion in 1943, and finally an all-time high of 3.5 billion in 1944. The dairy farm income in 1944 was approximately 15 per cent of the total of 22.6 billion dollars received by all farmers from all farm production. Dairy farm income has long held the lead over other farm enterprises, the leaders of which have generally ranked in the following order: dairy products, hogs, cattle and calves, eggs, cotton, truck crops, wheat, and corn.

Milk Production.—Total milk production on farms in the United States reached the 100 billion-pound mark in 1930. Thereafter the annual production remained above that figure, increasing fairly steadily to about 107 billion pounds in 1939, and then increasing more rapidly as a result of wartime demands until it reached an all-time high of 119 billion pounds in 1942. Production in 1943 and 1944 was only a little below the 1942 record. In addition to the milk produced on farms, from 2 to 3 billion pounds are produced each year by cows in towns and villages, all of which gives us a total milk production each year capable of supplying every person in the United States with slightly more than a quart a day. Not all milk is used or consumed in its fluid form, however. Some of it is made into butter, cheese, and various other products (See DAIRY PRODUCTS). Some is fed to calves, some wasted or lost, and some exported to other countries in the form of manufactured products.

Milk-Producing Areas.—Milk is produced in every state, both for home use and for sale; but dairy farming is more intensive in some regions than in others, and the business of producing and marketing milk in these regions is highly specialized. Most of the farmers in certain areas devote their entire time and attention to the dairy herd and to the production of milk for sale. In other parts of the country specialized dairy farms are found interspersed with farms of more diversified character. With a diversified system of farming, the main income may be derived from the feeding and marketing of beef cattle, hogs, sheep, or poultry, or from growing cash farm crops, such as corn, wheat, or cotton. Often, however, a few cows, either of the beef or dairy type, are milked as a side line.

The regions in which the greatest amount of milk is produced rank in the following order:

the East North Central states, West North Central states, North Atlantic states, South Central states, Western states, and South Atlantic states. Wisconsin produces more milk than any other state (the total yearly production being nearly twice as much as in Minnesota, which ranks second). New York is third in total production, followed by Iowa, Illinois, California, Michigan, Pennsylvania, Texas, Missouri, Kansas, Nebraska, North Dakota, Oklahoma, Tennessee, Kentucky, and South Dakota, in the order named.

Kinds of Dairying.—Although the 26 million cows that are milked throughout the entire country represent an average of about 4 cows per farm, several million farms have but one cow, and as many more have but 2 or 3. Where only a few cows are kept, it usually is for the purpose of furnishing the farm family with milk, cream, and butter. By far the greatest number of farms with from 1 to 3 cows are in the South, where other types of farming have long been more important than dairying. With only a few cows, however, there are times when more milk is produced than can be used by the family; it is then made into butter and sold to the local stores.

Diversified Farming.—The business of producing and selling milk is conducted differently on different farms, and in different places. Between 80 and 90 per cent of all the milk sold for retail consumption or for manufacturing purposes is produced by herds of less than a dozen cows. Herds of this size are usually found on farms that have other livestock and farming enterprises in addition to the dairy enterprise. Often the farm family provides all the labor needed in growing the crops, caring for livestock, or feeding and milking the cows. Extra hands, however, may be hired to help with the rush work during planting and harvesting.

This general diversified type of farming, which includes dairying as one of the principal sources of income, is scattered throughout the entire farming area of the United States. The whole milk may be sold and delivered to the local receiving or shipping station, or it may be separated on the farm and the skim milk retained for feeding farm animals. When only the farm-separated cream is marketed, as is largely the case in the Middle West and in the Great Plains region, it usually goes to the creamery for butter-making. More farmers are delivering whole milk than before World War II, because skim milk is finding more profitable use as human food than was formerly the case. When the whole milk is separated at the creamery, the skim milk may be dried for either animal or human food, or it may be made into a number of products such as cottage and other cheeses. Skim milk is nutritionally valuable, since it contains all the nutrients of the whole milk except the fat and vitamin A.

Specialized Dairy Farm.—Contrasted with the general type of dairy farm is the specialized dairy farm which relies on the production of milk or the sale of dairy breeding animals, or both, for practically its entire income. It combines the business of breeding with the business of producing milk for sale. Such farms may have from 50 to 100 head of milking cows, and an equal number of young stock. A few herds contain as many as 500 cows and are often the source of the purebred bulls and female stock on which the average dairy farmer depends for improving his herd. Herds are usually larger, and the business of producing and selling milk is more specialized

around big cities. Most of the milk produced within easy shipping distance of such population centers is sold for use as bottled milk or cream, and brings a higher price than milk sold for manufacturing purposes.

Commercial Dairy.—The so-called commercial dairy is another kind found near the large cities. Because land is scarce, or too expensive for growing feed and keeping young stock for replacement purposes, most of the feed is purchased in outlying farming areas and shipped in. Commercial dairying is merely a business of assembling good milking cows and the necessary feed, and then putting the feed through the cows to produce milk. No cows are kept to produce calves. Heifers or cows needed to replace wornout animals are bought as needed.

Producer-Distributor.—Still another kind of dairyman is the producer-distributor to be found around the smaller or medium-sized cities and towns. Like the general dairy farmer, he grows most of his own feed and raises his own herd replacements in order to maintain good milk-producing stock; but unlike the general dairyman who sells his milk wholesale, he conducts his own retail business and delivers milk and cream directly to his consumer-customers. When unable to obtain enough milk from his own cows to furnish all his customers' wants, he buys milk from other nearby farmers to augment his supply.

Sanitary Milk Production.—Because milk is a perishable food and because it is capable of carrying disease-producing organisms, great care must be taken with it. Disease-producing organisms, as well as those which merely cause milk to sour or develop bad odors and off-flavors, can get into it in many ways. And because milk is a good food for bacterial organisms, as well as for humans, they thrive and multiply rapidly in warm milk.

It is of great economic importance to the dairyman to produce and deliver clean, fresh, wholesome milk, with a low bacterial content. Much of his continued success depends on his ability to meet the market demands for a quality product. When consumers are offered good milk and milk products, they are encouraged to increase their consumption level. Good quality in bottled milk, as well as in such manufactured products as butter and cheese, is dependent first on good quality milk and cream from the farm.

Most of the bacteria in milk come from the body of the cow and from unclean milk utensils, although milkers infected with diseases of bacterial origin are also sources of contamination. Other sources are flies and dust, and impure water used in washing the utensils.

Utensils and Milking Machines.—Considerable improvement over primitive milking methods has been made as a result of research work. Milking pails and other utensils are better adapted to the task if they have smooth seams, or no seams at all, for they are easier to clean and are not so likely to harbor bacteria. Fewer bacteria enter the milk if the small-top pail is used; and there will also be less dirt and sediment in the milk if the hair is clipped from those parts of the cow that are immediately above the milk pail, especially the flanks, belly, and udder. The better dairymen wash the udder with a mild disinfectant and wipe it with a damp cloth before each milking to remove loose hair and dirt. The use of milking machines eliminates some sources of contamination due to hand milking, but great

care is required to keep the machine free from bacteria, especially those parts that come in contact with the milk. Machine parts, milk pails, cans, and all other utensils must be thoroughly washed and then treated with boiling water, steam, or a chlorine solution to kill bacteria.

The Milkhouse.—A convenient and sanitary milkhouse is standard equipment on all dairy farms where an effort is made to produce quality milk. An abundance of pure, fresh water is piped into the milkhouse and is used in cooling the milk, or providing boiling water or steam for all cleaning operations. As soon as milk is drawn from the cows it is taken to the milkhouse and strained into tall cans which are then set in the cooling tank. The water in the tank may be cooled to the proper low temperature with ice or by a mechanical refrigeration unit. The importance of prompt cooling is indicated by the fact that the bacteria commonly found in milk will multiply most rapidly at temperatures between 80° and 100° F. At 70° they will multiply at a slower rate, but at 40° or less the rate is very slow.

Flavors in Milk.—Other troubles which the dairyman must guard against are feed and weed flavors in the milk. Succulent feeds and certain weeds in the pastures are the most common cause of such undesirable flavors. Since they affect the milk only a few hours after they are eaten, it becomes necessary at times to remove cows from weedy pastures several hours before milking time, or to keep them off the pastures entirely while the weeds are in a growing stage. Cows must be taken off garlic-infested pastures in the spring, four to seven hours before milking time, to avoid a garlic flavor in the milk. Succulent feeds that cause bad flavors in milk are fed in the barn soon after the cows have been milked; flavors then have an opportunity to disappear from the cow's body before the next milking.

To prevent barn odors and feed flavors being absorbed from the air, and dust from dry feeds getting into the milk, many dairymen feed and house their cows in one barn and milk them in another which is commonly called the milking parlor.

Supervision and Inspection of Milk.—The dairy farmer who sells milk and cream that is to be consumed in the fluid state (market milk and cream) usually is required to meet certain sanitary regulations established by health officials. Much less official attention is paid to milk or cream that is sold for manufacturing purposes, although buyers at the processing plants inspect the incoming milk or cream and reject any that is not suitable for their needs.

Market milk may be transported long distances from the farm, by motor truck or railway carrier, sometimes across many states to the point of consumption. The final processing of milk or cream and delivery to the consumer, however, is usually a local operation; therefore most of the sanitary control of city milk supplies is exercised by state and city health authorities. Ordinarily state laws are more general in character than the city ordinances. They usually set the standards for fat content and nonfat solids, prohibit adulteration, fraud, or misbranding, and outline the more important essentials of sanitation. Municipal ordinances are generally more explicit and exacting in their sanitary requirements.

In Cities.—The milk ordinance of a large city

or community is usually administered and enforced by the city department of health, which may have a very complex organization. Such an organization often is headed by a chief milk inspector, working under the direction of the health department to carry out the general policies and objectives of obtaining an adequate and safe milk supply for the city. The organization also may include supervising inspectors for city plants and country, who direct inspection by special agents in their respective fields. To complete the organization, laboratories are maintained, staffed with chemists and bacteriologists who keep constant watch on the milk that enters the city.

In Smaller Communities.—In towns or smaller communities where only one or two inspectors are employed, the organization is very simple. Usually the inspectors collect the samples, make the laboratory tests, and report directly to the city health officer. Nearly all cities and towns of any importance have milk ordinances, which are enforced according to the interest shown by the people of the community and the funds made available for the purpose. Lack of interest and of sufficient funds for proper inspection and enforcement, however, frequently make the milk ordinance ineffective.

Milk inspection consists of two essential parts: (1) sanitary inspection to eliminate possible causes of contamination of the milk on the farm, during transportation, processing, and final delivery; (2) examination of the milk itself to make sure that contamination has not occurred. As an additional safeguard, most cities require milk to be pasteurized.

Pasteurization.—This process consists of heating milk to a temperature high enough to kill all disease-producing bacteria which might be found in milk, without heating enough to injure its nutritive qualities. Usually the pasteurizing plants are inspected frequently to check the adequacy of pasteurization treatment.

Raw, or unpasteurized, milk is always a potential danger to the health of the consumer, even when the milk is produced under the most sanitary conditions. The federal government, in cooperation with the states, has almost eliminated bovine tuberculosis from dairy cattle of the United States, and is constantly waging war against other cattle diseases transmissible through milk. Many people on the farms and in the smaller towns and villages, however, do not have the same protection given consumers in cities where milk supplies are under official inspection and control. But, in view of the marked decrease in milk-borne diseases, it can safely be said that on the whole the people of the United States have the safest milk supply of any country in the world.

Cattle Used for Milk Production.—There were no cattle of any kind in North America before it was settled by the white man. Columbus is said to have carried a few cows to supply milk for his crew, on his second voyage when he visited the island of Santo Domingo in 1493. It is known that cattle from Spain were landed at Veracruz, Mexico, in 1525. They were the ancestors of what later became known as Texas cattle. Cattle first arrived at Jamestown in 1611 and at Plymouth in 1624, but the date when they finally became firmly established on the continent of North America is still in doubt. During the early colonization period, however, settlers practically always brought cattle with them from their homelands. In time these cattle and their de-

scendants became intermingled and gave rise to our so-called native stock.

For 200 years or more the native stock was used for beef and milk production, and as draft animals. By the end of that period, however, European breeders had made considerable progress in developing cattle suited for more specific purposes. Beginning about 1800, American livestock men began importing a few of the European beef and dairy breeds, and a start was made toward improving the native stock through the infusion of purebred blood. Eventually, breeding associations were formed and herdbooks established for registering purebred animals and their descendants.

Today purebred cattle in the United States are classed either as dairy cattle, beef cattle, or dual-purpose cattle. The beef breeds include the Shorthorn, Hereford, Aberdeen Angus, and Galloway. The dual-purpose breeds—cattle bred for both beef and milk production—include the Milking Shorthorn, Red Poll, Polled Durham, and Devon. There are five dairy breeds of importance in the United States: Ayrshire, Brown Swiss, Guernsey, Holstein-Friesian, and Jersey. A breed represents the efforts made by livestock breeders over many generations toward improving the specific functions they desire in their cattle.

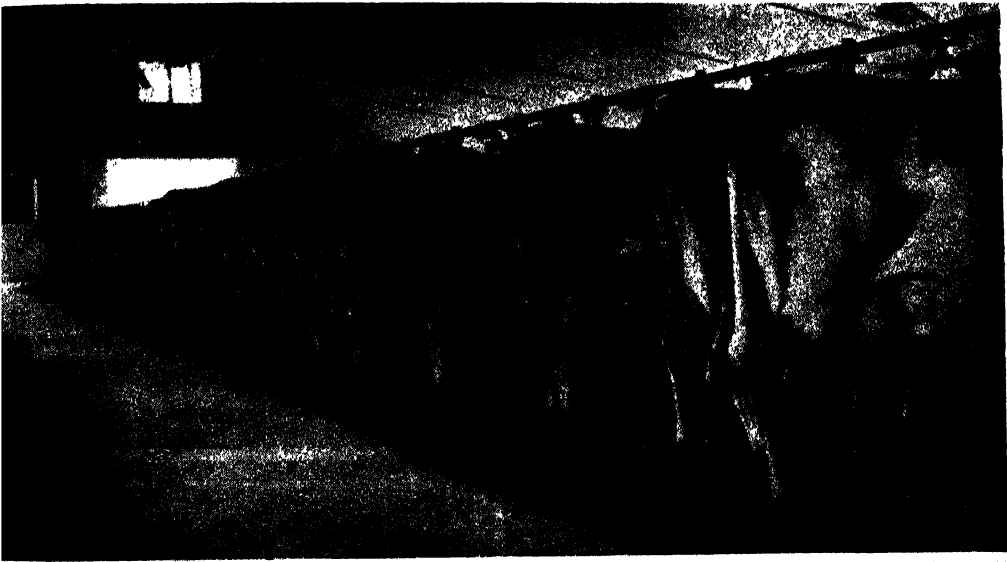
The individual animals of each of these breeds, when registered in the breed association herdbook, are looked upon as the elite of the breed they represent, and they have been the source of the improved blood used in grading up the native stock toward a higher concentration of the breed characteristics.

Of the 38 million cattle of all ages that are kept primarily for milk-producing purposes in the United States, only a little over 1 million are actually registered in the breed herdbooks. Between 25 and 26 million of the total number, however, are classed as grade dairy animals. They may be grade Ayrshires, grade Holsteins, or grade Jerseys, depending on which breed predominates in their makeup. A grade is the offspring resulting from the mating of a registered animal with a nonregistered animal. The latter may be a "scrub" animal of unknown ancestry or it may be a purebred animal that has not been registered. The offspring of a registered animal and a grade animal is also a grade, and through progressive use of registered bulls of one breed such animals become high grade. Grade animals that carry fifteen sixteenths purebred breeding, or more, are often indistinguishable from registered purebreds in their appearance or production performance, but they are not eligible for registry in the dairy breed herdbooks.

In addition to the purebred and grade animals of the five dairy breeds, some 8 or 9 million cattle of the dual-purpose and beef breeds are kept for milk production. The remainder of the total number of milking animals are cattle of no particular breed. They include the so-called native or scrub animals, mongrels, and crossbred animals.

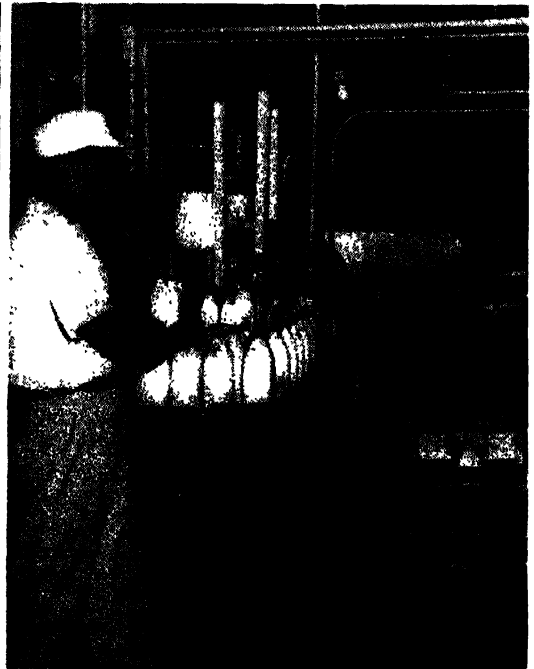
Dairy farmers differ in their preference for the different breeds. In general, Jerseys are preferred in the South and in areas where most of the farmers sell cream. Nearly 60 per cent of farm families that keep but one cow have Jerseys. Holsteins are most numerous in sections where the milk is sold largely for making cheese or evaporated milk, but there are also large numbers and large herds in the principal market-milk areas. Together, Jerseys and Holsteins (grades

DAIRY INDUSTRY



Top: The Borden Company dairy cows in pasture, feeding on clover, alfalfa, and orchard grass. Center: The Borden Company's barns are well-lighted, ventilated, and concrete-floored. Bottom: Regular visits by inspectors keep a check on conditions and record the milk yield.

DAIRY INDUSTRY



Top: Operators checking temperature and weight of butterfat. Center: Pasteurization holding tanks in a New York City dairy. Bottom left: Pasteurization exchangers in which milk is heated to 143 degrees, a temperature high enough to kill disease-producing bacteria without harming the milk, then cooled. Bottom right: The milk is bottled on an assembly line.

Top: Courtesy The Borden Company; others Gendreau

and purebreds) make up more than half of all the cows milked in the United States. Guernseys are about 11 per cent, and Ayrshires and Brown Swiss about 2 per cent. Approximately 21 per cent of all the cows are either dual-purpose or beef breeds and the rest of mixed breeding.

Purebred Dairy Cattle.—Each of the dairy breeds has its followers and enthusiasts. Dairy farmers who are interested primarily in breeding and selling purebred cattle have formed associations or clubs to promote their chosen breed in various ways. Each association has its own offices and staff to keep the herdbooks and to register the eligible animals of the breed, since these are recorded by name and number, the sire and dam of each registered animal being also on record. Through the herdbooks the pedigree of any registered cow or bull can thus be traced back to the foundation animals of the breed. Besides being from registered parents, each animal, in order to be eligible for registry, must meet certain color qualifications and other requirements laid down by the association. Most breed associations maintain a supplemental registration form for listing cows which meet the requirements established by the association for milk and butterfat production. Bulls that have a certain number of tested daughters are also given special recognition in the register.

Holstein Breed.—The largest of the dairy breeds is the Holstein. Mature bulls weigh from 1,700 to 2,200 pounds, and cows from 1,200 to 1,750, with occasional animals weighing even more. They are black and white, with the colors sharply defined rather than blended. They may be nearly all white or all black, but no solid-color animal can be registered. The breed originated in the Netherlands, in the Province of Friesland. Historical references indicate that these cattle have been bred in the same region for at least 2,000 years. The first Holsteins were imported into the United States in 1795, and a few were brought in afterward from time to time up to 1879; thereafter heavy importations were made each year until 1887. Few Holsteins have been brought in since then because of the almost constant prevalence of foot and mouth disease in the Netherlands. Holsteins produce a large quantity of milk, but the percentage of butterfat on the average is lower than in milk of the other breeds. Cows of all ages, registered by the breed association, have produced a yearly average per cow of 16,700 pounds of milk containing 574 pounds of butterfat. The world's record for milk and butterfat production by any breed is held by a Holstein cow, Carnation Ormsby Butter King. She produced in 1 year 38,607 pounds of milk containing 1,402 pounds of butterfat.

Jersey Breed.—Jerseys are the smallest of the dairy breeds in the United States. Cows weigh from 900 to 1,100 pounds and bulls from 1,300 to 1,600. The heifers develop rapidly and mature somewhat earlier than other breeds. The color is usually some shade of fawn or cream, although different variations of mouse color, gray, and brown are common, and some individuals are very dark. The tongue is usually black, and the muzzle black with a light-colored ring encircling it. The breed originated in the small Channel Islands between England and France, which include the islands of Jersey, Guernsey, Alderney, and Sark. The cattle on these islands were at one time called Alderney, but in 1789 a law was passed prohibiting further importation of cattle into the

island of Jersey. Shortly thereafter the cattle on that island became known as Jersey instead of Alderney cattle. No outside blood has been introduced since that time. The first importation of Jerseys into the United States was in 1850, and into Canada in 1868. During the next 20 years a few more were imported from the island of Jersey and some brought in from Canada. Since then importations have been numerous and steady, except during World War II when the islands were occupied by the Germans.

The cattle have been bred and improved in their native home for over 100 years, especially for butter production. They are popular family cows both in their native island and in the United States, because of their rich milk, their easy keeping qualities, and their gentleness. The milk is yellow and contains a higher percentage of butterfat than that of other breeds, though the quantity of milk is less on the average. Cows and heifers of all ages registered by the association have an average yearly production per cow of 8,580 pounds of milk containing 460 pounds of butterfat. The highest yearly milk production record for the Jersey breed, however, is 23,677 pounds, and the highest yearly butterfat record is 1,218 pounds.

Guernsey Breed.—This breed is between the Jersey and the Holstein in size, mature cows weighing from 900 to 1,400 pounds and bulls from 1,200 to 2,200. The color is fawn and white, with fawn predominating, but some individuals may be a light cherry red with white markings. The breed originated in the Channel Islands, near the north coast of France, probably as the result of a cross between the large red and brindle cattle of Normandy and the small red cattle of Brittany. After the importation of cattle from the Continent or between the islands of Guernsey and Jersey, had been forbidden by law, two distinct breeds came to be recognized. Guernseys were cattle from the islands of Alderney, Sark, and Guernsey, and those from the island of Jersey were known as the Jersey breed. The first animals recorded in the herdbook of the American Guernsey Cattle Club were brought over in 1830. A few more were imported in the next two decades, but not until about 1870 were extensive importations made. Since that time some Guernseys have been imported nearly every year. Guernsey milk, like that of the Jersey, is rich in butterfat and very yellow in color, often being sold at premium prices as table milk or cream. Being larger than the Jersey, Guernseys produce slightly more milk and butterfat. The average yearly production of cows registered in the breed herdbook is about 10,100 pounds of milk containing 500 pounds of butterfat. The highest yearly milk record of the breed is 24,008 pounds and the highest butterfat record 1,213.

Ayrshire Breed.—The Ayrshire, like the Guernsey, ranks between Jersey and Holstein in size, the average mature cow weighing about 1,050 pounds and the bulls about 1,650. Color varies from almost pure white to nearly all cherry red or brown, through any combination of these colors. The horns are large, and turn gracefully outward, then forward and back, giving a distinctive appearance to the head. The breed originated in the county of Ayr, southwest Scotland. There, as well as in some parts of England, it is the leading breed of cattle. The first importations of Ayrshires into the United States were in 1822. Since then a few have been imported almost every

year, either from Scotland or Canada. One of the strong points of Ayrshires is their excellent grazing ability whereby they can thrive on rocky pastures and under conditions where animals of the larger breeds, especially the Holstein, would find it difficult to maintain themselves. The milk is not so yellow as Jersey or Guernsey milk nor quite so rich in butterfat, being more like Holstein milk in these respects. The breed is noted, however, for good uniform milk production. The average yearly yield by all registered cows is about 10,400 pounds of milk containing about 416 pounds of butterfat. The highest individual yearly production records of the breed are 25,320 pounds of milk and 955 pounds of butterfat.

Brown Swiss Breed.—This is one of the oldest breeds in existence, having been domesticated and developed in Switzerland long before historic records began. The large frame of the Brown Swiss cattle indicates that they have been developed for service as draft animals as well as for milk. They are sturdy in appearance and the body is well covered with flesh. Heifers mature rather slowly, but when full grown the cows weigh from 1,100 to 1,500 pounds and bulls from 1,500 to 2,200. Color varies from dark to light brown, and at some seasons of the year approaches gray. There is usually a light stripe of gray along the back. White splashes near the udder are found on some animals, but white on the sides or back is objectionable. The hair between the horns is usually of a lighter shade than on the body. The nose, switch, tongue, and horn tips are always black and there is usually a light or mealy colored ring around the muzzle. The Brown Swiss produces milk of average richness compared with that of other breeds. Cows which have been registered have an average yearly production of about 13,700 pounds of milk containing 550 pounds of butterfat. The highest individual production records for the breed are 29,570 pounds of milk and 1,200 pounds of butterfat.

Dairy Herd Improvement.—American dairy farmers have some of the best milk-producing cows in the world, but they also have some of the poorest. On the whole, the cows milked throughout the United States do not produce as much milk per cow as they should for the most profitable returns, nor as much as would be possible if efficient methods of breeding, feeding, and management were more widely adopted.

The average yearly production of all cows—including the purebreds, grades, scrubs, beef cattle and those of mixed breeding—is approximately 4,500 pounds of milk and 182 pounds of butterfat per cow. These averages are gradually being raised as purebred cattle replace other kinds, and as more and better proved bulls are used in private and cooperative breeding programs.

One of the greatest forces for improving the average production of all dairy cattle is the cooperative dairy-herd-improvement association program, which is sponsored by the United States Bureau of Dairy Industry and the various state agricultural colleges. A dairy-herd-improvement association consists of approximately 26 dairy farmers in a community who hire a tester to visit each herd one day each month and weigh the milk of each cow, test its butterfat content, and compute the feed cost and income for each cow. With this information the owner of the herd is in position to determine which are his unprofitable cows. He can then dispose of them and feed the remainder better.

In 1946, some 30,000 dairy farmers were keeping records in these associations in every state, and following approved practices suggested by state dairy extension workers and other dairy leaders. These associations are thus a medium through which the newest information, developed by research and experimentation, is put into practice. Milk and butterfat production per cow has increased steadily in the association herds ever since the program was started in 1905. The cows in the first association averaged 5,300 pounds of milk and 215 pounds of butterfat per cow per year; the averages in 1946 were 8,592 pounds of milk and 346 pounds of butterfat.

The primary purpose of any dairy-herd-improvement association is to provide each member with records and other information he can use to improve the profitableness of his own herd. Taken collectively, the production records from large numbers of herds in all the states now serve as the basis of a nationwide breeding program. Breeding programs center around the herd bull. If he is the kind of bull whose daughters are better milk producers than their mothers, the herd will improve, otherwise not. Good transmitting bulls are scarce and can be located only by studying the production records of the daughters of a large number of bulls, and comparing the daughters' records with those of their mothers. The records obtained from the association herds furnish the opportunity for making such studies.

Since 1935 the Bureau of Dairy Industry, in cooperation with the state dairy extension specialists, has been collecting thousands of production records from the association herds each year and tabulating them to "prove" the bulls that have been used in the association herds. More than 2,000,000 production records, representing 900,000 cows (daughters and dams) and 100,000 sires, were in the bureau's files in 1946. Each year more records are added. Clerks in the bureau make periodic surveys of the records, and as soon as a bull is found which has five or more daughters listed by his name, the records of the daughters are compared with the records of their dams to determine whether the bull raised or lowered the average production through his daughters. This is termed proving the bulls. Several thousand bulls are proved each year, some 17,000 having been proved since the program was started.

Each year a list of the bulls proved during that year is published by the Bureau of Dairy Industry. This provides a valuable guide for any dairyman who is looking for a bull to improve his herd. Less than half of the bulls proved each year have been found good enough to raise production in the herds where they were used. There may never be enough good proved bulls to go round, but the sons of good proved bulls are a much better risk than bulls whose sires have not been proved. By proving a large number of association bulls and listing their sons, the program affords a means of providing the best available bulls for the average farm herd.

Artificial breeding is the basis of the newest herd improvement program. When outstanding bulls are used in an organization employing the artificial breeding technique, many farmers can obtain better breeding service for their herds than they would otherwise be able to afford if they had to own their own bull. An artificial breeding organization is usually sponsored by the state

college, and the very best bulls obtainable are used as the source of the semen. Farmer members enroll their cows for breeding service, paying a specified fee. The cow may be several hundred miles distant from the college or other center where the bulls are housed and cared for. Agents for the organization carry the semen to the farms and impregnate the cows, the semen from one bull being diluted sufficiently for impregnating a large number of cows at one time. Artificial breeding was first adopted on a commercial basis in 1938. Since that year over 700,000 cows have been served artificially each year, with one bull providing the semen for about 500 cows, or from 10 to 50 times as many as would be served naturally.

Feeding for Milk Production.—After good cows have been obtained, either by selection and purchase, or by breeding, the farmer must feed them properly if he is to make a profit by turning feed into milk. Any cow must have a certain amount of feed just to live and bear a calf. Any feed she gets in excess of these needs is available for making milk. If the excess feed is too limited to enable her to produce as much milk as she is inherently capable of producing, she will lose weight and decline in milk flow. If the excess feed is more than she needs for manufacturing the amount of milk she is producing, she will put on weight. The expert dairyman neither overfeeds nor underfeeds his cows. He uses milk production records and adjusts the amount of feed monthly to keep the cow producing at her maximum without getting too thin or too heavy.

Feeds are of two main kinds: roughages and concentrates. The roughages, which are the cow's natural feeds, include pasture herbage, hays, silages, and root crops. Concentrates include the farm grains, such as corn, wheat, barley, and oats; mill byproduct feeds, and feeds rich in protein, such as cottonseed meal, soybean meal, and linseed meal. Brewers' grains, distillers grains, and dried beet pulp are frequently used in localities where these feeds are produced.

Because the cow can handle large amounts of roughage, and because roughages are essential for proper functioning of the digestive processes in the cow, these feeds are of first importance. Another reason is that home-grown roughages are usually a cheaper source of milk-producing nutrients than the farm grains or purchased concentrates and mixed feeds. Experiments have shown that cows will produce at least 75 per cent of their potential yield if they are fed good hay alone.

Obviously, therefore, profitable feeding requires first that cows have all the good hay or other roughage they will eat. Then, if they are capable of producing more milk than can be made with roughage alone, concentrates are added to the roughage ration. The amount of grain or other concentrates to feed is determined largely by the prices of these feeds in relation to the price of milk. When the price of milk is low, and the price of concentrates is high, farmers reduce the amount of concentrates accordingly and depend more on roughage feeds, sacrificing maximum quantity of milk production for a cheaper cost per unit of milk produced.

Because of the economy and nutritional importance of pasture herbage, hays, and other roughages, farmers now give considerably more attention to producing good quality roughage than

formerly. Grazed or harvested in the earlier stages of maturity, grasses and legume crops are richer in protein and lower in fiber. The good farmer makes every effort to harvest his hay crops before they ripen or mature so much that they lose their leaves, which are rich in protein; and to cure the crop with the least loss of green color or damage by rain. Green color is an indication of the carotene content of the roughage, and it is the carotene from which the cow makes vitamin A for her own needs and for enriching her milk.

The silo is the dairy farmer's best friend from a feeding standpoint. The corn crop has long been the principal crop preserved in the silo, but research workers have found that hay crops can be preserved equally well and that making silage has many advantages over the conventional methods of curing hay in the field and storing it in the mow or stack. See also CATTLE.

Consult BULLETINS: *Dairy Cattle Judging*, Farmers' Bulletin No. 1769 (1937); *Care and Management of Dairy Bulls*, Farmers' Bulletin No. 1412 (1938); *Care and Management of Dairy Cows*, Farmers' Bulletin No. 1470 (1938); *Cooperative Dairy Bull Associations*, Farmers' Bulletin No. 1830 (1939); *Feeding Dairy Cows*, Farmers' Bulletin No. 1626 (1940); *Feeding, Care and Management of Young Dairy Stock*, Farmers' Bulletin No. 1723 (1940); *The Making and Feeding of Silage*, Farmers' Bulletin No. 578 (1941); *Dairy Cattle Breeds*, Farmers' Bulletin No. 1443 (1942); *The Dairy Herd-Improvement Association Program*, Farmers' Bulletin No. 1974 (1945).

O. E. REED,

L. S. RICHARDSON,

U. S. Department of Agriculture.

DAIRY PRODUCTS. The most important dairy product from the standpoint of the dairy industry and of the consumer is milk for consumption, as fluid milk or table cream. This is frequently spoken of as market milk to distinguish it from milk used for manufacturing butter, cheese, ice cream, and other dairy products. In the typical peacetime year of 1940, 40.6 per cent of the domestic milk supply was utilized as market milk and cream, 40.0 per cent as butter, 7.0 per cent as cheese, 9.7 per cent in other manufactured products, and 2.7 per cent was fed to animals. These percentages refer to whole milk and disregard the skim milk, whey, and buttermilk, which are produced as byproducts in the manufacture of cream, cheese, and butter. The byproducts are the sources of other dairy products, although the major portion is fed to animals.

The quantities of total milk produced in the United States in the peacetime year of 1940 and the wartime year of 1944, and of dairy products made from this milk are shown in the accompanying table. The characteristics of each product and information regarding the processes employed in their manufacture are given in the paragraphs following.

Milk.—The term milk is used commonly to mean the normal secretion of the mammary glands of cows, though it properly includes the mammary secretion of any female mammal. Goats' milk is used for food in many sections of the United States, and the milks of other animals, such as the ewe, buffalo, mare, camel, and reindeer, are used as food in some other countries.

All milks contain the same components, but the relative proportions of these components differ

widely with the species of animal producing the milk. The composition of cows' milk is relatively constant, except for the percentage of fat, which differs with the breed and inheritance of the cow. The average composition of cows' milk is 87.0 per cent water, 3.9 per cent fat, 2.75 per cent casein, 0.73 per cent whey protein, 4.9 per cent milk sugar and 0.72 per cent ash. Other substances, such as enzymes, vitamins, and various nitrogen compounds, are present in quantities negligible in percentage, but important in their effects on nutritional value, and on spoilage.

Milk fat is a mixture of glycerides of fatty acids, the acids present in the largest amounts being oleic, palmitic, myristic, stearic, butyric, and lauric. The relative proportions of these acids differ over a wide range, depending principally on the feed of the animal producing the fat. The hardness of milk fat is affected by the proportion of fatty acids present; the feeding of linseed meal, for example, causes the fat to be soft and oily, and the feeding of cottonseed meal causes the fat to be relatively firm.

The fat of milk is in the form of globules suspended in the water solution which makes up the greater part of milk. Each globule is en-

slower by decreasing the size of the fat globules by means of an homogenizer, a machine in which milk is forced by pressure through very minute passages. If cream is agitated at such a low temperature that the fat particles are semisolid, the globules will agglomerate or run together, thus changing the suspension of fat globules in water to a suspension of water droplets in fat. This is the process of churning and the product is butter. If the agitation beats in air and is not continued for too long a time, the product is whipped cream, in which bubbles of air and globules of fat are suspended in the water portion of the cream. If a cream containing sugar and flavoring materials is whipped and partly frozen, the product is ice cream.

The casein in milk is a unique protein composed principally of about 20 different amino acids combined in an apparently definite proportion. Casein differs from most other proteins in that it contains phosphorus, which acts as a linkage between certain of the amino acids. It also contains calcium phosphate, which is readily released when acid is added to milk. Casein exists in milk in suspension as particles with diameters less than 0.1 of a micron (4 millionths of an

TABLE 1—MILK PRODUCTS IN THE UNITED STATES

	1940	1944
	1,000 pounds	1,000 pounds
Total milk produced	112,336,000	121,778,000
Market milk and cream (as milk)	45,591,000	56,146,000
Creamery butter	1,836,826	1,488,502
American cheese (Cheddar)	606,927	809,663
Swiss cheese	48,659	45,571
Brick and Muenster cheese	34,328	27,435
Limburger cheese	8,198	7,510
Italian varieties of cheese	26,002	41,721
Cream cheese	51,183	40,176
Cottage, pot and baker's cheese	174,257	224,374
Other varieties of cheese	11,440	27,494
Chocolate milk, cultured milks, etc. (est.)	2,000,000	2,000,000
Evaporated whole milk	2,464,668	3,428,089
Condensed whole milk, sweetened	138,093	202,731
Condensed whole milk, plain	128,017	119,405
Condensed skim milk, sweetened	167,889	370,151
Condensed skim milk, plain	246,910	367,831
Condensed buttermilk	111,842	157,503
Dried whole milk	29,409	177,754
Dried skim milk, human food	321,843	582,869
Dried skim milk, animal feed	159,962	16,397
Dried buttermilk	67,931	56,683
Dried whey	110,158	141,553
Casein	46,616	14,883
Malted milk, powder	20,021	40,549
Milk sugar	5,413	12,684
	1,000 gallons	1,000 gallons
Ice cream	318,068	444,277
Milk sherbet	8,089	49,481

closed in a thin protein membrane. These globules are of different sizes from 0.1 to 10 microns in diameter, with the average diameter about 3 microns—one ten-thousandth of an inch. The number of globules per cubic centimeter of normal milk is between 2 and 4 billion. Since the density of milk is 1.032 and that of the fat is 0.898, the fat tends to rise gradually to the surface of the milk. This is what is known as rising of cream, or creaming, and its rate is faster the larger the fat globules. The rate of rising can be greatly increased by means of centrifugal force, as in the cream separator, which produces cream and skim milk in a few minutes, in contrast to gravity creaming which requires hours. The rising of cream can be made very much

inch) which cannot be seen in a microscope. These particles are so small that, although they have a density greater than that of the serum in which they are suspended, they do not settle. The action of rennet, an enzyme obtained commercially from calves' stomachs, causes casein to coagulate practically unchanged in chemical composition. This procedure is the basis of the manufacture of most varieties of cheese. Increasing the acidity of milk also causes casein to coagulate, but it leaves in solution the calcium phosphate that was associated with it in the milk. This procedure is the basis of processes for making cottage cheese and commercial casein.

Whey protein is the substance remaining after casein has been precipitated from milk by the

action of rennet or acid. It can be separated into a lactalbumin fraction and a lactoglobulin fraction, differing slightly from each other and from casein in composition. Particles of whey protein are much smaller than those of casein and are usually considered as being in solution in milk rather than in suspension.

Milk sugar (lactose) occurs naturally only in milk. It is a disaccharide, or compound sugar, composed of glucose and galactose. These two simple sugars can be obtained from milk sugar by heating it in a solution containing acid. Milk sugar is less sweet and less soluble in water than are cane sugar and other common sugars.

The 0.72 per cent of ash in milk comprises 0.17 per cent calcium oxide, 0.24 per cent phosphorus pentoxide and 0.18 per cent potassium oxide, with smaller proportions of chlorides, sodium oxide, and oxides of other metals. The calcium and phosphorus are of special interest because of the need of these elements in nutrition.

Milk is an important source of most of the known vitamins, especially of riboflavin (B_2), which is soluble in water and hence is present in skim milk and whey as well as in whole milk. A pint of milk contains enough riboflavin to supplement adequately the usual daily diet, and a quart furnishes the total daily requirement of this vitamin for an adult. Since vitamin A is soluble in fat, it is more highly concentrated in cream and butter than in milk. Milk, butter, and eggs are the only common foods containing appreciable quantities of vitamin D, and even they contain very little in comparison with cod liver oil; hence the addition of vitamin D to market milk.

Market Milk.—Milk sold at retail in the United States may be classified as raw or pasteurized. It is estimated that more than 75 per cent of market milk is pasteurized. Pasteurization consists of heating milk to at least 143° F. and holding it at that temperature for 30 minutes, or of heating it to 160° F. and holding it for 15 seconds. The milk is then cooled promptly to 50° F. or lower. Pasteurization, properly done, kills all disease-producing bacteria which may be present in milk, but has no significant effect on its appearance, flavor, and food value. The low-temperature, long-time method destroys an appreciable proportion of the thiamine and ascorbic acid of milk, but it is claimed that the high-temperature, short-time method has practically no destructive effect on these vitamins.

Certified milk is that produced to conform to rigorous standards of cleanliness set by the American Association of Medical Milk Commissions. Most certified milk is pasteurized, but in some localities it is available in raw condition.

Homogenized milk is that which has been treated mechanically to decrease the size of the fat globules. Fat does not rise as cream on homogenized milk, but remains finely and evenly distributed. The flavor of milk is improved by homogenization. It is probably true that homogenized milk is more easily digested than is unhomogenized milk, since softer curds are formed in the stomach. Soft-curd milk, frequently recommended for infants, may be produced by homogenization, by boiling, by acidification, or by treatment to decrease the percentage of calcium in the milk.

Skim milk is that form from which a part, or practically all, of the fat has been removed as cream. It also lacks the vitamin A, which is associated with the fat. Although skim milk is a

highly nutritious food, very little is sold as such at retail. Soured by bacteria that produce lactic acid, it is sold as cultured buttermilk; flavored with chocolate or cocoa and sweetened with sugar, it is sold under various names such as chocolate-flavored milk drink; the term "chocolate milk" is properly applied to this beverage only when it is made from whole milk.

Vitamin D milk is milk enriched, usually by addition of a vitamin D concentrate, less frequently by irradiation of milk with ultraviolet light, or by feeding irradiated yeast to the cows producing it. To meet the requirements for acceptance by the Council on Foods and Nutrition of the American Medical Association, vitamin D milk must contain not more than 400 U.S.P. units of vitamin D per quart. Most regulatory agencies require that the potency be stated on the container or bottle cap.

Cream for retail sale is prepared by separation from milk in a centrifugal cream separator and subsequent standardization to definite fat concentrations by means of addition of skim milk. Coffee cream, or light cream, should contain at least 18 per cent fat according to federal standard, some states requiring 20 or 22 per cent; whipping cream, at least 30 per cent fat by federal standard; double cream, at least 36 per cent fat. The greater proportion of market cream is pasteurized. See also separate article MILK.

Butter.—The composition of butter made in creameries is remarkably uniform, conforming closely to the federal standard which requires it to contain not less than 80 per cent butterfat, and to some state standards which require it to contain not more than 16 per cent water. It usually contains one per cent or more of curd, 1.5 per cent or more of salt and added color. The natural color of butter is due to vitamin A. Butter used in ice cream and bakery products is not salted, and some unsalted butter enters retail trade. Farm butter is more variable in composition than creamery butter.

The pleasing flavor and aroma of butter are owing to the presence of small quantities of substances produced by bacteria that function in the souring of the cream from which the butter is made. Diacetyl, which is considered the most important of these flavoring substances, is present in highly flavored butter only to the extent of about 1.5 parts per million. The oily, metallic, fishy, and tallowy flavors that may develop in butter during storage have been found to be due to chemical changes which take place chiefly in the nonfat constituents of butters of high acidity. Hence, butter made from sour cream is highly flavored, but deteriorates rapidly in flavor during storage; butter made from sweet cream in which acid has not been allowed to develop is mild in flavor, but has excellent keeping qualities. In some of the creameries in the United States, it is customary to neutralize partially the acidity of sour cream before churning in order to produce a highly flavored butter that will keep well. In others, sour cream is neutralized and pasteurized and, following this treatment, a starter culture of acid- and flavor-producing organisms is added and allowed to produce a controlled amount of acid and flavor. Sweet cream may be cultured to develop acid and flavor or, if sweet cream butter is the desired product, it is churned without prior culturing.

For most successful churning, cream should contain between 30 and 35 per cent fat and

should be sufficiently cooled so that the fat will be semisolid. The churning process consists in agitating cream to cause the fat globules to coalesce. After 30 to 60 minutes churning, the fat granules have increased in size to that of grains of wheat, and separate from the buttermilk. The butter at this stage is removed from the buttermilk, washed several times with cold water and then mechanically worked or kneaded to remove moisture, distribute salt, and produce the desired waxy texture. Overworking causes butter to become salty and sticky.

In the United States, butter for the wholesale trade is packed in 63-pound tubs or as 60- or 68-pound cubes. Wooden or fiber containers impregnated with paraffin are generally used and are usually lined with parchment previously soaked in brine. The consumer package for butter usually contains one pound, either as a single block, 2 half-pound blocks, or 4 quarter-pound blocks. Each block is wrapped separately in paraffined paper and the outer container is of paraffined cardboard.

Butter oil is practically pure butterfat and is made by melting butter, washing the fat with water, and whirling it in a centrifuge to remove water and other nonfat substances. Its keeping quality is better than that of butter and it is used by bakers instead of butter, and by ice cream makers instead of cream. Renovated butter is made by converting low-grade butter into butter-oil, treating it with steam and air to remove unpleasant flavors and odors, mixing it with skim milk, and churning the mixture.

Plastic cream is a dairy product intermediate in composition between ordinary cream and butter in that it contains 65 to 70 per cent fat. It is made by putting cream of less fat content through a high-speed separator, and is properly considered cream, since the fat globules have not coalesced. It is used in the manufacture of ice cream and of cream cheese. See also separate article BUTTER.

Cheese.—Cheese is a concentrated food product made from milk by coagulation of the protein, and removal of a considerable proportion of water and substances soluble in water. The water solution removed is known as whey. The quantity of fat in cheese varies from a trace to percentages greater than those of protein, depending upon whether the cheese is made from skim milk, partially skimmed milk, whole milk, or milk enriched with cream. Whole milk cheese is required by federal standard to contain 50 per cent of its solids as fat. Standards for moisture percentage vary from 39.0 to 50.0 per cent, depending on the variety of cheese. Milk sugar may be present in freshly made cheese to the extent of 1.5 to 4.0 per cent, but is not to be found in well-ripened cheese, since in the curing process it is converted to acids, mainly lactic, and in cheeses with gas holes the milk sugar changes to carbon dioxide and hydrogen. A portion of the salts of milk, principally calcium phosphate, is retained by most cheeses.

The curdling, or coagulation, of the protein is accomplished either by rennet, a substance obtained from calves' stomachs or, in the case of some soft cheeses, by acid formed from milk sugar by bacterial action. After draining and pressing to remove a large part of the whey, cheese curd is cured or ripened under controlled conditions of temperature and humidity, which differ for cheeses of different types. Bacteria and, for some cheeses, molds are the ripening

agents. These organisms may be present in the milk, but are usually added to the milk during the making process or, in the case of mold-ripened cheeses, are added to the curd, or introduced on the surface of the cheese. In the ripening process, protein is converted into a more digestible form, milk sugar is fermented to organic acids, and various substances with strong flavors are produced, largely by chemical changes in the fat. Gas formation is considered undesirable except in a few varieties of cheese, such as Swiss.

A list of varieties of cheese made in various countries would contain several hundred names, but the number of distinct types is very much smaller. Only the more important types manufactured or sold in the United States are considered here. Listed in approximately the decreasing order of hardness when ready for consumption, they are: Parmesan, Swiss, Cheddar (American), Roquefort, brick, Limburger, Camembert, Neufchâtel, cream, and cottage. Several of the harder varieties are marketed in a reworked condition as club or processed cheese, and in mixtures with such food substances as whey protein, cream, pimentos, and pickles as cheese spreads.

American or Cheddar cheese is the variety most extensively made and consumed in the United States. It is usually made from whole milk. It is found in the market as large wheels weighing 60 pounds or more; as smaller wheels under such names as twins, daisies, Young Americas, longhorns, and picnics; and as rectangular blocks or loaves. It is also available in 12-ounce cans and as processed cheese. A typical Cheddar cheese contains 25 per cent protein, 32 per cent fat, 38 per cent water, and 4 per cent salts. The manufacture of Cheddar cheese is described here in detail as an example of cheesemaking processes.

The quality of Cheddar cheese depends largely on the care and handling of the milk from which it is made. Clean milk of low bacterial count, of low acidity, and free from dirt and unpleasant odors and flavors is essential for the production of high-grade cheese. A good grade of cheese can be made from high-grade raw milk, but, regardless of the grade of the milk, the cheese will be of better quality if the milk is pasteurized.

The milk after pasteurization at 163° F. for 15 seconds should be cooled to 86-87° F. and 0.5-1.0 per cent of a starter culture added. The starter is a growing culture of bacteria which produces lactic acid and flavoring substances in milk. About an hour after addition of the starter, 3 ounces of rennet, diluted with 40 ounces of water is added for each 1,000 pounds of milk in the vat. In 20 to 30 minutes a firm curd will form, which is cut into ¾-inch cubes by means of wires spaced in frames. The curd is then stirred and heated to expel whey and firm the curd. The temperature should be increased to 100° F. during the next half hour. The curd is stirred at this temperature until 2¼ hours have elapsed from the time of addition of the rennet. The curd is then pushed back from the outlet of the vat and the free whey is drained off. The curd is packed evenly about 8 inches deep in the vat, space being left in the middle for later turning and handling. As soon as the curd has matted sufficiently to be turned without breaking, it is cut into slabs 5 to 6 inches wide and turned over. Every 10 to 15 minutes the curd is turned, alternating quarter turns with half turns. After the fifth turning, the slabs are piled two deep.

Turning is continued, the top slabs being put on the bottom each time. This cutting and matting is known as "cheddaring" and is a unique feature in the making of cheese of this type. After $2\frac{1}{4}$ hours of turning the curd should be firm enough to mill, which is accomplished by passing it through a machine which cuts it into small pieces. The milled curd is spread evenly over the bottom of the vat and stirred with a fork or by hand for 15 minutes. Salt is then sprinkled over the curd in several applications, a total of $2\frac{1}{2}$ to 3 pounds of salt being used for each 1,000 pounds of milk. The curd is worked over with a fork until the salt is evenly distributed and then piled along each side of the vat. When draining stops the curd is forked again. This draining and forking is repeated several times until the curd is as smooth as it was before salting. The curd is then transferred to cheese hoops lined with cheese cloth, and pressed for about half an hour. The exposed end of the cheese is then covered with cheese cloth, and pressing continued for 12 to 24 hours. The pressed cheese is placed in a drying room for 4 to 7 days at 50° to 60° F. to form a rind. It is turned each day. The cheeses are then dipped in paraffin heated to 220° F. and placed in a curing room at 50° to 60° F. for a period of several months to a year. They are then ready for consumption.

Swiss cheese is characterized by a rubbery texture, holes or "eyes," and a slightly sweetish, nutlike flavor. It typically contains 28 per cent protein, 29 per cent fat, 39 per cent water and 4 per cent salts. It is made from whole milk to which a small proportion of skim milk is usually added, since the generally accepted standard is 43 per cent of fat in the solids of the cheese. The process of manufacture differs from that for Cheddar cheese chiefly in that several cultures are used (including one to cause development of the "eyes" and the characteristic flavor); higher temperatures are used in the making process; the whey is removed by draining from a cloth sack, and salt is applied to the surface of the cheese rather than mixed with the curd. For details of the highly technical procedures employed, bulletins of the United States Department of Agriculture and books on cheese manufacture should be consulted.

Parmesan is a large, Italian-type cheese produced from partially skimmed milk. The making and salting require about 40 days, after which the cheese is cured for several years, being rubbed occasionally with linseed oil. The cheese becomes very hard and is grated before using. It contains approximately 36 per cent protein, 27 per cent fat, 31 per cent water and 6 per cent salt.

Roquefort is a semihard cheese made from whole milk. The curd, which is neither heated nor pressed, is inoculated with a greenish mold; the ripened cheese is mottled with the mold, is soft and friable, and has a sharp peppery flavor. Roquefort cheese has been made in France for many years from sheep's milk, but a similar cheese is made in the United States from cow's milk and sold as Bleu cheese. The Gorgonzola of Italy and the Stilton of England are similar to Roquefort and are made from cow's milk. The composition of Roquefort is like that of Cheddar.

Brick cheese is a bacterially ripened, semihard, whole milk cheese intermediate in type between Swiss and Limburger and is made mostly in the United States. Port du Salut, Muenster and Oka are similar cheeses of foreign make.

Camembert is a soft cheese ripened by molds that remain on the rind and secrete enzymes which penetrate the body of the cheese and produce the soft texture and typical flavor. Brie is a cheese of the same type.

Limburger is a soft cheese, made usually from whole milk, and is ripened by bacteria.

Neufchâtel, *cream*, and *cottage* are soft cheeses that are not ripened. They may be stored at low temperatures, but must be consumed within a comparatively short time after manufacture. Neufchâtel may be made from skimmed, partially skimmed, or whole milk. Rennet is used for coagulation, but cultures of lactic acid bacteria are used for flavor production. Cream cheese differs from Neufchâtel in that it contains a greater proportion of fat, since it is made from cream or whole milk enriched by the addition of cream. Both Neufchâtel and cream cheese are worked to produce a smooth consistency. Neufchâtel cheese contains approximately 15 per cent protein, 25 per cent fat, and 50 to 60 per cent water; cream cheese, approximately 10 per cent protein, 40 per cent fat, and 45 per cent water.

Cottage cheese is made from skim milk, but cream is usually added after the curd is separated from the whey. Either rennet and acid, or acid alone, may be used for curdling and the curd is left in a coarse condition. Pot and baker's cheese are modifications of cottage cheese and are made for use in bakery products. Cottage cheese usually contains between 12 and 20 per cent protein, less than 1 per cent fat, and between 70 and 80 per cent water. Creamed cottage cheese should contain at least 4 per cent fat.

Processed cheese is made by melting cheese in steam-jacketed kettles with the addition of salts, such as sodium citrate and sodium phosphate, to make the melted cheese plastic. After thorough mixing to blend the different cheeses used, the cheese while hot is poured into the package and allowed to cool. See also separate article CHEESE AND CHEESE MAKING.

Ice Cream.—Ice cream, which in the early part of the 20th century was made almost entirely in the home, has since become a standardized, commercially manufactured product. In the factory, an unflavored ice cream mix is prepared, flavoring not being added until just before freezing. There are no federal standards for percentage fat in ice cream; state standards differ, and are usually either 8, 10, or 12 per cent butterfat. The ice cream mix contains usually 8 to 14 per cent butterfat, 9 to 11 per cent of milk solids other than fat (milk sugar, protein, and salts), 14 to 16 per cent sugar, and 0.3 to 0.5 per cent stabilizer such as gelatin or alginate. The dairy products that are used in proportioning the mix include whole milk and skim milk, either fluid, condensed or dried, cream, unsalted butter, and butter oil. The ingredients are mixed while cold, and the mix is then pasteurized and homogenized. It is then cooled and is usually allowed to stand in a refrigerator for a few hours or overnight to permit the fat to solidify and other desirable changes to take place before the mix is frozen.

The ice cream freezer has two functions: to freeze the mix partially, and to whip in air. It is necessary that the ice cream issuing from the freezer be sufficiently fluid to flow into the cans in which it is to be stored for hardening. The incorporation of an equal volume of air in ice cream mix gives to the finished product a light,

fine-grained texture and improves its palatability. Without whipped-in air, ice cream is coarse and soggy. Freezers of two types are used. The batch freezer is essentially a mechanically driven, commercial-size development of the home freezer; the continuous freezer is constructed so that the mix is fed in at one end and the partially frozen ice cream is discharged at the other. The freezing is so regulated that about one half of the water is frozen and sufficient air is whipped in to double the volume of the mix. After the ice cream is discharged from the freezer, it is placed in a hardening room at 0° F. or lower, where the freezing is completed. It may be stored in the hardening room for months without serious deterioration in quality. Before being sold it is softened by being held for a short time in a cabinet at about 15° F. Milk sherbets are similar to ice cream, but contain a smaller percentage of fat.

Evaporated and Condensed Milk.—Evaporated milk is the term applied to whole milk that has been concentrated by removal of part of its water and sterilized by heating in the retail-size cans in which it is sold. Sweetened condensed milk is that form which has been similarly concentrated, but has been preserved by the addition of sugar rather than by sterilization. Plain condensed milk is concentrated milk that has neither been sterilized nor preserved by means of sugar. Sweetened condensed is sold in retail-size cans for home use, and both sweetened condensed and plain condensed milk are marketed in bulk containers for use by food manufacturers. Sweetened condensed skim milk, plain condensed skim milk, and plain condensed buttermilk are also manufactured, and are used almost entirely by manufacturers of ice cream and bakery products.

Evaporated milk usually has the following composition: 8 per cent fat, 7 per cent protein, 9.5 per cent milk sugar, 1.5 per cent ash, and 74 per cent water. Federal standards require 7.9 per cent fat and 25.9 per cent total solids. Sufficient water has been removed to convert 2.1 pounds of fluid milk into one pound of the evaporated product; hence, to reconstitute to normal concentration, evaporated milk and water should be mixed in approximately equal parts.

In the manufacture of evaporated milk the first step is forewarming, which consists of heating the fluid milk to from 190° to 212° F. This heating is done to prevent curdling during the sterilizing process and to produce the proper degree of thickness or body in the product. The milk, while still hot, is drawn into an evaporator and there concentrated under sufficient vacuum so that the milk boils at about 126° F. After concentrating, the milk is homogenized to break up fat globules and thus lessen the tendency of the fat to rise. Vitamin D concentrate may be added at this point, if desired. The evaporated milk is sealed in cans and sterilized by heating to about 240° F. for 15 minutes. If the concentrated product is to be marketed as plain condensed milk, sterilization is omitted and it is packed in 10-gallon cans or other bulk containers. Plain condensed milk must be stored under refrigeration and used within a short time after manufacture, since it is highly perishable. It has the advantage over sterilized evaporated milk in that it lacks the color and cooked taste produced by the sterilization process.

Sweetened condensed milk contains on the average 8.6 per cent fat, 7.7 per cent protein,

12 per cent milk sugar, 1.6 per cent ash, 42 per cent cane sugar, and 28.0 per cent water. The concentration of milk solids is about 2.2 times that of fluid milk, and cane sugar has replaced part of the water. The cane sugar is added to the fresh milk, which is then forewarmed and concentrated as described for evaporated milk. The product is then cooled to about 80° F. and stirred to cause milk sugar to separate as fine crystals. It is then cooled to 60° F. and sealed in cans; for although the high concentration of sugar prevents the growth of bacteria, molds will grow on sweetened condensed milk unless it is kept from contact with air. Sweetened condensed milk does not have the cooked flavor characteristic of evaporated milk, and it can be used only for such purposes as those which require sugar or for which sugar is not objectionable.

Dried Products.—The principal dried dairy products on the market are dried whole milk, dried skim milk, dried buttermilk, dried whey, dried ice cream mix, and malted milk. Generally they contain about 3.5 per cent water. With the exception of malted milk, these are manufactured by the spray, atmospheric drum, or vacuum drum processes.

In the spray process, the fluid product, which has been previously partially concentrated, is sprayed into a chamber through which a current of dry, heated air is forced. The fine droplets are converted almost instantaneously into a powder, which is separated from the air by the force of gravity, or by a cyclonic motion of the air, and falls to the bottom of the chamber. Dried milks made by this method are finely divided, readily soluble in water, and have a tendency to become sticky by taking up water from the air.

In the atmospheric drum processes, steam-heated, rotating drums, which may be operated singly or as closely set pairs, are coated with partially concentrated milk, which dries as it travels part way around the drums and is scraped off by closely fitting knives. The coarse flakes of dried milk are then ground to powder. Because of the high temperature necessary to dry the film of milk, the dried product is slightly discolored and comparatively insoluble. This method is used mainly in drying skim milk and buttermilk for use as feed for animals, though during World War II most of the skim milk dried by this process was used in food.

In the vacuum drum process, the drums are enclosed in an airtight chamber in which a partial vacuum is maintained during drying. This arrangement makes it possible to dry milks at much lower temperatures than by the atmospheric drum process and thus avoid discoloration and insolubility. The product is similar in its characteristics to spray-dried milk.

Dried whole milk, dried skim milk to be used for human food, and dried ice cream mix are made preferably by either the spray or vacuum processes. Since the dried products made by these processes tend to take up water from the air and become sticky and caked, they are packed in sealed containers, unless they are to be used promptly. The air in cans containing dried whole milk or ice cream mix is pumped out and replaced with an inert gas such as nitrogen, since the fat in these products is gradually made unpalatable by action of oxygen. Dried skim milk, known also as nonfat dry milk solids and defatted milk solids, is used extensively in bread

and other food products, and when it is to be so used, is usually packed in lined slack barrels.

Dried skim milk for animal feed and dried buttermilk are usually produced in the atmospheric drum drier. In drying whey, special procedures must be used to avoid the caking of the dry product due to absorption of water and caking of the milk sugar. Two stages of drying are usually employed.

Malted milk, which consists of approximately half barley malt and wheat flour and half milk solids, is dried preferably in a vacuum evaporator fitted with heavy agitators. When the drying is completed, air is admitted and then the vacuum is suddenly increased, thus puffing the product into a porous mass which solidifies and can be either sawed into blocks or ground into powder for marketing.

Dried whole milk and dried skim milk are used largely in ice cream, milk chocolate, bread, cake, and other baked products. Some dried buttermilk and dried whey are used in food products, but most of these two products are used in poultry and animal feeds. The lower grades of dried skim milk are used in animal feeds. Malted milk is used to some extent in bread, cake, and confections, but is mostly used in food beverages at soda fountains and in homes.

Casein.—Casein is a unique dairy product in that it has a variety of nonfood industrial uses. Casein coagulated by means of rennet is used for making casein plastics; casein coagulated by acid

casein serves as a lubricant, decreasing the heating which occurs during flexing of the tires. Casein fiber is of considerable interest; its production in the United States began in 1940. The solution of casein in alkali, to which are added small amounts of soap and metallic salts, is extruded through fine openings into an acid solution. It coagulates and the resulting fiber is stretched and treated with substances that make it tough and resistant to water and other cleaning agents. Casein fiber is similar to wool in its characteristics, but somewhat softer. It is blended with hair for making felt for hats, and woven in mixtures with wool, rayon, and cotton to make fabrics for dresses and coats.

Milk Sugar.—Milk sugar, or lactose, is produced on a comparatively small scale and, until World War II, was used mainly to modify cow's milk for feeding infants and as a basis for pills and tablets. In the later years of World War II, it was necessary to double the production of milk sugar in order to meet the demands for its use in the production of penicillin.

Milk sugar is made from whey produced either in the manufacture of casein or of cheese. In general, the procedure consists of coagulating the whey protein by heating the whey to nearly boiling, evaporating water from the clear whey under vacuum until it contains 60 to 70 per cent solids, and crystallizing the milk sugar from this sirup. The crystals are whirled in a centrifuge to remove excess sirup and washed lightly. The

TABLE 2—COMPOSITION OF DRIED DAIRY PRODUCTS

	Protein	Ash	Milk Sugar	Fat	Fluid equivalent per pound
	per cent	per cent	per cent	per cent	lbs.
Dried whole milk.....	26.5	6.1	38.0	26.5	8.0
Dried skim milk.....	36.0	8.0	52.0	1.0	11.0
Dried ice cream mix ¹	10.9	2.2	15.2	28.0	2.7
Dried buttermilk.....	36.0	8.0	48.0	5.0	11.0
Dried whey.....	12.5	9.0	72.0	0.9	16.0
Malted milk ²	14.5	3.5	21.5	8.5

¹ Contains also 40.7 per cent added cane sugar and 1 per cent stabilizer.

² Contains also 48.0 per cent of a mixture of barley malt and wheat flour.

is used in glue, in coating paper, in water-thinned paints, in synthetic rubber products, and as a textile fiber.

Casein for plastics is made by adding rennet to skim milk, draining the whey from the coagulated casein, washing it, pressing out water, drying and grinding it. In making the plastic products, the dry casein together with pigments is mixed with sufficient water to form a heavy dough, and the mixture is forced through round dies to form rods. These rods may be flattened in presses to form sheets. Buttons, costume jewelry, and similar articles are cut from these rods and sheets. The fashioned articles are soaked in formaldehyde solution to harden and toughen them.

Acid-precipitated casein may be coagulated either by hydrochloric or sulphuric acid added to the skim milk, or by lactic acid formed in the milk by action of bacteria on milk sugar. The curd is washed, pressed, dried, and ground. For industrial use, casein is dissolved in alkali, forming a glue-like solution.

In coating paper, clay or other pigment is added to the casein solution, the casein acting mainly as an adhesive to glue the pigment to the surface of the paper. In synthetic rubber tires,

sugar must be recrystallized from water solution in order to produce a high-grade product.

Beta lactose is a form of milk sugar made by crystallizing from a solution at a temperature above 200° F. It has the advantage over the ordinary, or alpha form, in that it is more soluble in water and therefore more convenient for use in making formulas for feeding infants. Solutions of milk sugar, whether made from the alpha or beta form, rapidly become identical in composition at room temperature or above, since either will change partly to the other after being dissolved, the solution finally containing the two forms in the ratio of 1.65 parts of the beta to 1.00 part of the alpha sugar.

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O. E. REED,

E. O. WHITTIER,

United States Department of Agriculture.

DAISY (from "day's eye," in allusion to the appearance of the flower), a name applied to many plants of the Aster family, especially to those in which the heads are surrounded by white rays. The daisy proper is *Bellis perennis*, native of Europe, often grown, in its double forms, for its handsome flowers.

DAISY MILLER. To know this novel by Henry James in all its forms, from the straightforward first telling of the story in the *Cornhill Magazine* in 1878 to its revision in the New York edition of 1909, including the preface to the latter and the reworking of the former as a comedy (printed in the *Atlantic Monthly* in 1883), is to know the matter and the manner of its author as well as any one book or group of books can indicate the changing style and spirit of an author. Although refused by the first publisher to whom it was offered, as "an outrage on American girlhood," *Daisy Miller* justified itself by its later success both in Britain and the United States. It was, James says, "promptly pirated in Boston—a sweet tribute I hadn't yet received and was never again to know—and became ultimately the most prosperous child of my invention." Although essentially dramatic in its quality as a story, it lost its character when rewritten as a play, and *Daisy Miller: A Comedy* was the first of a line of paradoxical failures which marked the playwritings of this dramatic storyteller. As a character, too, Daisy Miller was one of the first of a long line—the successful line of those "international young ladies" who represent over a third of the feminine interest in James' stories. Like Charlotte Verver and Maggie, Julia Bride, Isabel Archer, Miss Gunton, Pandora Day, and dozens of others, she was young America sketched on a background of Europe, where neither the glare of her moneybags nor the shadow of her newness could obscure her real inwardness. Whether she was altogether fine like Isabel Archer in *The Portrait of a Lady*, exquisitely, unmorally superior like Charlotte Verver in *The Golden Bowl*, or naively, tragically vulgar, made up of "charming little parts that did not match and that made no ensemble," like Daisy Miller, she was always a type that Henry James drew with vigor, truth and affection.

For anyone interested in the contrast between the "early" and the "later" manner of James, a parallel reading of the first and last editions of *Daisy Miller* will well repay study. Artistically, the simpler diction and form of the original is as much better suited to the tale as it would be less well suited to the more intricate psychology of *The Awkward Age*, *The Ambassador*, or *The Golden Bowl*.

DAKAR, dā-kār', seaport, French West Africa, capital of the overseas territory, located in Senegal territory on the south side of Cape Vert (Verde) Peninsula. From 1924 to 1946 Dakar and adjoining areas (which included Gorée and Rufisque) constituted an autonomous entity termed DAKAR AND DEPENDENCIES (area,

60 square miles; pop., 1945, 175,000). The harbor is one of the finest on the Atlantic coast of Africa, and is equipped with modern port facilities. A railroad connects Dakar with Rufisque and Saint Louis (165 miles), whence a steamer service the year round on the Senegal River as far as Podor (140 miles). The port was founded in 1857 opposite the island of Gorée, which had been in French possession since 1677. A naval base was developed there, and in 1902 Dakar became the capital of French West Africa. After France capitulated to the Germans in World War II the local administration of Dakar acknowledged the authority of the Vichy regime, and this precipitated an abortive attack on the garrison by Free French and British naval forces on Sept. 23-25, 1940. Pop. (1948 est.) 228,000.

DAKOTA, river, North and South Dakota, so named by act of the Territorial legislature but often called the James. It rises in Wells County, N. Dak., and flows south across South Dakota into the Missouri. It is 710 miles long.

DAKOTA INDIANS, a tribe in North America, which constituted at one time an important element in the great Sioux group. Primarily the Dakota Indians are divided into three bands each having a distinct dialect: Santee, Yankton, Teton. These classify as follows: Santee, subdivided as Mdewakanton, Wahpekute, Wahpeton, Sisseton; Yankton, subdivided as Yankton, Upper Yanktonai, Hunkpatina or Lower Yanktonai; Teton, subdivided as Upper Brulé, Lower Brulé, Oglala, Miniconjou, Sans Ars, Two Kettle or Oohenonpa, Hunkpapa, Blackfoot or Sihasapa. The famous seven council fires of the Dakota Confederacy consisted of the four Santee bands, the Yanktons and Yanktonai and the Tetons, considered as one band. In 1658 they had 30 towns on the Mississippi, the Missouri, and Saint Croix. They attacked the whites in 1862 under Little Crow when some of the most horrible cruelties known in history were committed. On the discovery of gold in the Black Hills, they rose again when the famous defeat of George Armstrong Custer occurred in 1876 on the Little Big Horn. A final rising during the Ghost-dance of 1890-1891 was subdued by Gen. Nelson Appleton Miles. The Dakotas are the highest type of Indian, physically, mentally, and probably morally, of the western tribes. They are located in North and South Dakota, Nebraska, Montana, and a few in Canada. See also INDIANS, AMERICAN; SIOUAN.

DAKOTA STAGE, one of the formations of the Lower Cretaceous series in the United States. The rocks, mostly conglomerates, clays, and sandstones, cover a vast area extending over the Great Plains from Texas northward into Canada. Their origin is still a matter of speculation, since they are not marine; and in Texas lie unconformably upon the Comanche limestone. Near the Rocky Mountains the Dakota beds are much tilted, hardened, and eroded. West of the Rocky Mountain uplift the Dakota rocks are more fine-grained and include beds of coal or lignite of workable thickness. In much of the Rocky Mountain region the Dakota rests conformably upon Comanchean and even Jurassic strata. The lower cross timber sand of Georgia and Mississippi is probably equivalent to the Dakota. See also CRETACEOUS.

DAKOTA WESLEYAN UNIVERSITY, a Methodist-controlled, accredited, coeducational institution, Mitchell, S. Dak.; enrollment generally exceeds 200 students.

DAKSHA dŭk'shà, in Hindu mythology, a priest to whom Siva, his son-in-law, gave a ram's head after cutting off Daksha's head in anger, because the latter did not invite the god to his grand sacrifice.

DAL, Vladimir Ivanovich. See DAHL, VLADIMIR IVANOVICH.

DALADIER, dà-là-dyā, Édouard, French statesman: b. Carpentras, Vaucluse, June 18, 1884. The son and grandson of bakers, Daladier, while studying at the Lycée Duparc at Lyon, came under the influence of his history instructor, Édouard Herriot, whom he followed into the teaching profession, receiving his degree of *agrégé* in history at the University of Lyon. In 1909 he was teaching history at Nîmes; subsequently he held appointments at Grenoble, Marseille, and finally at the Lycée Condorcet in Paris. While teaching at Grenoble, he was elected mayor of his native Carpentras. With the advent of World War I in 1914, he joined his regiment. He served in combat units as private, sergeant, and captain, earning the Legion of Honor, Croix de Guerre, and three citations for bravery. Demobilized in 1919, he returned to his post at the Lycée Condorcet, but only for a fortnight. Herriot had persuaded him to run for Parliament as a Radical-Socialist candidate to represent Vaucluse. Elected deputy, for the next 21 years he was regularly returned to the Chamber by his department.

As Herriot's protégé he was at first little regarded in legislative circles, where lawyers skilled in debate held the center of the stage. However, his knowledge of army affairs gradually gained him recognition. He traveled in England, the Soviet Union, and Germany, paying particular attention to military developments in those countries, and by 1923 had come to be regarded by his party as their expert on military affairs. In 1924, Premier Herriot gave him his first cabinet post as minister of the colonies. Four years later, having become leader of the left wing Radical Socialists, he was elected president of the party. From 1928 to 1931 he held the posts of minister of public works in three cabinets and minister of war in another; and, early in 1933, he became premier of France.

With Britain's prime minister, Neville Chamberlain, Daladier bowed to Hitler's demands at Munich in 1938. He was still prime minister when France and Great Britain declared war against Germany on Sept. 3, 1939; but, charged with ineffective prosecution of the war, he was forced to resign on March 20, 1940. Minister of defense and war in the succeeding Reynaud cabinet until May 20, he then became foreign minister. On June 6 he resigned this post, and on November 17 the Vichy government arrested and imprisoned him. He was a defendant in the German-inspired Riom war-guilt trials (February 1942). These trials proving embarrassing to the German cause they were suspended two months later. For the succeeding three years he remained imprisoned first in France, then in Germany. American troops rescued him from imprisonment in Itter Castle, Austria, on May 5, 1945. After his return to France he testified

at the trial of Marshal Henri Pétain and was elected honorary president of the Radical Socialist Party.

In the Constituent Assembly elections of June 2, 1946, he was elected deputy for Vaucluse. The Communists, hating him for having dissolved the traitorous Communist organizations in September 1939 and disqualified their deputies by a law of Jan. 26, 1940, challenged his election, but he was seated by overwhelming vote on July 19, 1946. The following November 10 he took his seat in the first National Assembly under the new constitution.

DALAGUETE, dà-là-gā'tā, municipality on Cebu Island, Philippine Islands, located on Bohol Strait, near the southern end of the island, 46 miles south-southwest of the city of Cebu. It was founded in 1711. Pop. (1948) 29,333.

DALBERG, dāl'bĕrk, the name of an ancient German noble family. In the Holy Roman Empire, the head of the family was styled First Knight of the Empire.

KARL THEODOR ANTON MARIA VON DALBERG (Feb. 8, 1744–Feb. 10, 1817), last archbishop-elect of Mainz, attended the universities of Göttingen and Heidelberg and, after studying canon law, was ordained in the church. In 1772 the elector-archbishop of Mainz appointed him governor of Erfurt; he was elected coadjutor of Mainz and Worms in 1787 and of Konstanz (Constance) in 1800. Becoming bishop-elect of Mainz and archchancellor of the Holy Roman Empire in 1802, he endeavored to strengthen the central government of Germany. His efforts proved unavailing, and in 1804, on the invitation of Napoleon, he went to Paris and there met Pope Pius VII, whose approval he sought for reorganization of ecclesiastical affairs in Germany. With the dissolution of the empire in 1806, he allied himself with Napoleon, who appointed him prince primate of the Confederation of the Rhine. In 1810 he was made grand duke of Frankfurt, but Napoleon's fall deprived him of all his dignities and powers except the archbishopric of Regensburg.

BARON WOLFGANG HERIBERT VON DALBERG (Nov. 13, 1750–Sept. 27, 1806), brother of Karl Theodor, was a dramatist who staged the early dramas of Schiller at Mannheim, and wrote several plays and adaptations of Shakespeare.

DUC EMMERICH JOSEPH DE DALBERG (May 30, 1773–April 27, 1833), a son of the latter, was sent to Paris in 1803 as envoy of Baden. In 1809, he entered the service of Napoleon who created him a duke and appointed him a councillor of state in 1810. He espoused the Bourbon cause in 1814, and as a minister plenipotentiary accompanied Talleyrand to the Congress of Vienna. One of the signatories of the decree outlawing Napoleon (1815), with restoration of the monarchy he was made a peer of France and appointed a minister of state. In 1816 he was made ambassador to Turin. His daughter, Marie Louise Peline de Dalberg, married Sir Richard E. Acton, a British baronet who assumed the additional name of Dalberg; their son, Sir John Emerich Edward Dalberg-Acton, became 1st Baron Acton (q.v.).

DALBERGIA, dāl-bŭr'jī-ā, a genus of fine tropical forest trees and climbing shrubs, natural order Leguminosae, some species of which yield

excellent timber. *D. latifolia* (the blackwood, or East Indian rosewood) is a magnificent tree, furnishing one of the most valuable furniture woods. *D. sissoo* gives a hard, durable wood, called sissoo, much employed in India for railroad ties and housing. Similar forms are found in Brazil.

D'ALBERT, däl'bërt, Eugen ([Eugène] Francis Charles), Anglo-French pianist and composer: b. Glasgow, Scotland, April 10, 1864; d. Riga, Latvia, March 3, 1932. After early instruction under his father, Charles Louis Napoleon d'Albert, a composer of dance music, he studied in Vienna, and in 1907 he succeeded Joseph Joachim as director of the Hochschule in Berlin. He was also court pianist to the king of Saxony. From 1883 he frequently appeared on the concert stage in the United States. He excelled as an interpreter of the works of German composers, especially Beethoven. Besides string quartets and symphonies, he composed numerous operas, among them *Tiefland* (1903); *Die toten Augen* (1916); and *Scirocco* (1921).

DALCHO, Frederick, American physician and clergyman: b. London, England, 1770; d. Charleston, S. C., Nov. 24, 1836. After his father's death he went to live with an uncle in Baltimore, Md., where he received a classical and medical education. Following brief service as an army surgeon, he practiced medicine in Charleston, S.C., and helped to establish a botanical garden there. After 1807 he became an editor of the *Charleston Courier*, a Federalist daily. His interest in theological studies finally led to his being ordained in the Protestant Episcopal Church; in 1819 he became assistant at St. Michael's in Charleston, where he remained. His works include *Historical Account of the Protestant Episcopal Church in South Carolina* (1820).

DALE, David, Scottish industrialist and philanthropist: b. Stewarton, Ayrshire, Jan. 6, 1739; d. Glasgow, March 17, 1806. Commencing life as a weaver, he became a dealer in linen and imported yarn; Turkey-red dye, which he was the first to introduce into Scotland, was known as "Dale's red." In partnership with Sir Richard Arkwright he erected a cotton mill at New Lanark, near the Falls of Clyde, and built model housing for his workers. He disposed of the New Lanark mill in 1799 to English capitalists. They entrusted the management to Robert Owen (q.v.), who subsequently married Dale's eldest daughter. Dale was also interested in other Scottish mills, and manufactured cotton cloth in Glasgow, a city of which he was a generous benefactor. Withdrawing from the Church of Scotland in 1770, he organized and became first pastor of a religious community known as the Old Independents or "Dalites."

DALE, Sir Henry Hallett, British biologist: b. London, 1875. After graduating at Trinity College, Cambridge, he studied medicine at St. Bartholomew's Hospital, London, and in 1904 was appointed director of the Wellcome Physiological Research Laboratories. He resigned this post in 1914, and from 1925 to 1935 he served as secretary of the Royal Society. During these years his researches were concerned mainly with physiological chemistry, his discoveries contribut-

ing greatly to fighting typhoid, enteric fever, and malaria. He was the first to identify one of the two chemical substances which form an essential link in practically all nervous action. In 1932 he was created knight, and in 1936 he shared with Otto Loewi, the German pharmacologist, the Nobel Prize for physiology and medicine. He became director of the National Institute for Medical Research, at Hampstead, London, and from 1942 until his retirement in 1946 he was Fullerian professor of chemistry in the Royal Institution and director of the Davy-Faraday Research Laboratory. In 1944 he received the Order of Merit, one of Britain's most coveted distinctions. During 1940-1945 he was president of the Royal Society. He resigned in 1948 honorary membership in the Soviet Academy of Sciences, in protest against the subjugation of science in the Soviet Union to political dogma.

DALE, Richard, United States naval officer: b. Norfolk County, Va., Nov. 6, 1756; d. Feb. 26, 1826. At outbreak of the American Revolution he supported the cause of the colonists, but was captured by the British and for a time served in their navy. Taken prisoner by the Americans, he thereafter served them loyally. While a midshipman aboard the American brig *Lexington*, he was captured by the British off the coast of France and was imprisoned in England. He managed to effect an escape and joined John Paul Jones as first lieutenant of the *Bon Homme Richard*, taking part in the engagement with the *Serapis*. After the war he sailed in merchant ships until 1794, when he was commissioned captain in the United States Navy. During 1801-1802 he served in the Mediterranean in the operations against Tripoli. In December 1802 he retired from the navy and made his permanent home in Philadelphia, where he was much esteemed.

DALE, Robert William, English Congregational minister and educational reformer: b. London, Dec. 1, 1829; d. March 13, 1895. He was educated in Birmingham, and there spent most of his life. One of the leaders of nonconformity in England, he served during 1868-1869 as chairman of the Congregational Union. An outspoken liberal in national and civic affairs, he was a proponent of church disestablishment, and urged the secularization of education. In 1877 he delivered a series of lectures on preaching at Yale University, being the first Englishman appointed to the Lyman Beecher lectureship. For seven years he was editor of the *Congregationalist*. His numerous books include *The Atonement* (1875); *The Living Christ and the Four Gospels* (1890); *Fellowship of Christ* (1891).

DALE, Sir Thomas, colonial administrator in North America: d. Masulipatam (Bandar), Madras, India, Aug. 9, 1619. He served in the Netherlands from 1588 until 1609, for his services there being knighted in 1606 by James I. Sent by the London Company to Virginia in 1611 as marshal, he remained there until 1616, from 1614 as acting governor of the colony. His administration was notable for its severity. He placed the colony under martial law and published a code of severe repressive laws generally known as Dale's Code. Besides defeating the Appomattox Indians, he founded the settlements of Henrico and Bermuda Hundred. He was recalled from Virginia to England in

1616, was sent with an East India Company fleet against the Dutch in 1618 and defeated a Dutch fleet near the present Batavia in December 1618.

Consult Force, Peter, *Tracts and Other Papers Relating to the Colonies in America*, vol. III, no. 11, (Washington, D.C., 1836-46); Neill, E. D., *The Virginia Company of London* (London 1869); Brown, Alexander, *The Genesis of the United States* (Boston 1891); id., *The First Republic in America* (Boston 1898).

DALE, Thomas Nelson, American geologist: b. New York, Nov. 25, 1845; d. Pittsfield, Mass., Nov. 16, 1937. In 1885 he joined the United States Geological Survey and became geologist in 1892; retired in 1920; instructor in geology and botany at Williams College 1893-1901. He published *The Scientific Spirit Applied to Living Subjects* (1913); *The Commercial Granites of New England* (1923).

DALECARLIA, dāl-ě-kar'li-ā (Swed. DALARNA or DALARNE), an old district of Sweden, comparable with the present Province of Kopparberg. It is an area rich in the history of its patriotic farmer peasants. It is heavily forested and there are numerous iron and copper mines in the area. See also SWEDEN—History.

D'ALEMBERT, dā-lam-bār', the assumed name of Jean Le Rond, French mathematician and philosopher: b. Paris, Nov. 16, 1717; d. there, Oct. 29, 1783. He was the natural son of Chevalier Destouches and Madame de Tencin. As an infant he was left on the portico of the Chapel of St. Jean le Rond. His father contributed secretly toward his support and had him educated by the Jansenists at the Collège Mazarin, where he was especially brilliant in mathematics, physics, and astronomy. At the age of 22 he published a work on integral calculus and two years later a work on the refraction of solid bodies. His *Traité de dynamique* (1743) is an epoch in mechanical philosophy. In it is elaborated his famous principle, "The impressed forces are equivalent to the effective force." He was elected to the Academy of Sciences in 1741 and to the French Academy in 1754, becoming the perpetual secretary of the latter in 1772. From 1751 to 1758 he was associated with Denis Diderot in editing the *Encyclopédie*. To it he contributed the general introduction, sketching in broad outline the evolution of civilization, art, and science. He was invited by Frederick II to become president of the Berlin Academy, and by Catherine II of Russia he was offered 100,000 francs a year as tutor to her son. Because of his desire to live simply, he refused both offers. In his last years he was closely associated with Mlle. de Lespinasse, and her death in 1776 was a shock from which he never recovered.

D'Alembert ranks among the greatest geometers of his century, and holds a high place also in literature and philosophy. His great service to letters was his exposure of the evils of patronage and his fostering the independence of his class from social and political power. His other works include *Éléments de la musique théorique et pratique suivant les principes de M. Rameau* (1752); and *Essai sur les éléments de philosophie* (1759).

Consult Diderot, Denis, *Le rêve d'Alembert* (Paris 1769); Condorcet, Marquis de, *Éloge de D'Alembert* (delivered before the Academy, Paris 1784); Bertrand, J. L. F., *D'Alembert* (Paris 1889). There is a partial edition of D'Alembert's *Works* by M. H. A. Bossange (Paris 1821).

DALEN, dā-lān', Nils Gustaf, Swedish engineer: b. Stenstorp, Nov. 30, 1869; d. Stockholm, Dec. 9, 1937. He was educated at the Goteborg Engineering Institute and the Zurich Polytechnicum. An eminent consulting engineer, he was employed by the Swedish Carbide and Acetone Company in 1905. He invented a method for dissolving acetylene in acetone which is used for automatic lighting in unmanned lighthouses and for railway signals; and he improved hot air turbines, air compressors, and milking machines. In 1912 he received the Nobel Prize in physics and in 1913 was elected to the Royal Swedish Academy of Science. In the latter year he was blinded as the result of a laboratory explosion, but he continued his experimental work until his death.

DALHOUSIE, 9TH EARL OF (GEORGE RAMSAY), British soldier and administrator: b. 1770; d. 1838. He served at Martinique; in the Irish Rebellion of 1798; in Egypt; in the Peninsular War; and was present at the Battle of Waterloo. In 1815 he was raised to the peerage as Baron Dalhousie. He was lieutenant governor of Nova Scotia, 1816-1819, and governor in chief of Lower Canada, Upper Canada, Nova Scotia, New Brunswick, and Prince Edward and Cape Breton islands, 1819-1828. From 1829-1832 he was commander in chief in the West Indies. Dalhousie University was named for him.

DALHOUSIE, 10TH EARL AND 1ST MARQUIS OF (JAMES ANDREW BROWN RAMSAY), British statesman: b. Dalhousie Castle, near Edinburgh, April 22, 1812; d. there, Dec. 19, 1860. Appointed governor general of India in 1847, he showed marked ability in the administration of his post, establishing railways, telegraphs, and irrigation works. Under him the Punjab, Oudh, and numerous other native states in India, as well as Pegu in Burma, were annexed to the British Empire. He was regarded as one of the greatest of the Indian proconsuls.

DALHOUSIE, town, New Brunswick, Canada, county seat of Restigouche County, picturesquely situated at the mouth of the Restigouche River on Chaleur Bay. It is a popular summer resort, and is the gateway to an extensive lumbering, hunting, and salmon fishing area. It is on the Canadian National Railway, and has an excellent harbor. A paper mill of 800 tons daily capacity, employing over 600 people, is the leading industry. Pop. (1950 est.) 4,700.

DALHOUSIE UNIVERSITY, an institution of higher learning at Halifax, Nova Scotia, founded in 1818, and subsequently named for the 9th earl of Dalhousie who laid the cornerstone of the first building May 22, 1820. It was first called the College of Halifax, but in 1821 the legislature made it a grant of £1,000 and changed its name to Dalhousie College. University status was granted it in 1841. It was modeled after the University of Edinburgh. Its original endowment was part of the customs collected at the port of Castine, state of Maine, during its occupancy in the latter part of the War of 1812 by a Halifax expedition under Sir John Sherbrooke, then lieutenant governor of Nova Scotia. The college did not begin to function until 1838, in which year Pictou Acad-

emy joined forces with it. Attempts to unite it and King's College, then at Windsor, were unsuccessful. In 1843 the institution closed its doors, and it did not again open them as a college until 1863. During the 20-year period the governors either allowed the funds to accumulate or managed it as a high school. In 1863 the college was reorganized, with a staff of six professors, a tutor in modern languages and about 60 students.

The governing bodies of the institution are:

(1) The board of governors, the supreme governing body; appointments to it are made by the governor in council on the nomination of the board. The governors have the management of the funds and the property of the college; the power of appointing the president, professors and other officials, and of determining their duties and salaries, and the general oversight of the work at the university. (2) The senate, consisting of the president and professors. To this body are entrusted, by statute, the internal regulations of the university, subject to the approval of the governors. All degrees are conferred by the senate. (3) The faculties of arts and science, law, medicine and dentistry. These are committees of the senate for the supervision of the teaching of the university, the preparation of regulations governing the courses of study and the recommendation of suitable candidates for prizes, scholarships, diplomas and degrees. In addition to the courses in the liberal arts and in pure science and engineering, the university has schools of law, medicine and dentistry, and a faculty of graduate students. In affiliation with the Halifax Conservatory of Music and the Maritime Academy of Music, it gives courses for the diploma of licentiate in music and the degree of bachelor of music. In affiliation with the Nova Scotia College of Pharmacy it gives courses leading to the degree of bachelor of pharmacy. The university is well equipped for its work and is constantly enlarging its sphere of usefulness.

Dalhousie has a large student body and admits students of either sex. The first site of the college was on the Grand Parade. In 1887 the college was removed to Carleton Street, where the professional schools still are. In 1915 the arts and science departments were removed to the Studley estate, a beautiful site of 42 acres on the outskirts of the city, near the North West Arm. This was made possible by the results of a canvass for funds for building and endowment in 1912 which brought in \$400,000. This great endowment constituted only one other evidence of the loyalty of Dalhousie's friends. It has been equalled only once in her history, in the years 1879 to 1884, when the late George Munro of New York City gave her funds, amounting to about \$350,000.

An event of great importance academically occurred in the summer of 1923, when King's College, following the great fire which wiped out most of the college buildings in Windsor, moved to Halifax, and now shares the campus of Dalhousie University. The new King's College is built on the Studley property, and was formally opened in the summer of 1930. The staffs of the two institutions are combined into a single faculty of arts and science, and the students of both institutions are combined for purposes of instruction (except that King's freshmen may have classes by themselves in purely arts subjects). King's College, however, retains its en-

tire corporate organization, residential life and internal discipline. Both institutions are now on the first list of the Carnegie Accepted Institutions. A new Arts Building and a skating rink have been erected.

DALI, dā'lē, Salvador (Felipe Jacinto), Spanish artist: b. Figueras, Spain, May 11, 1904. After completing undergraduate studies in Figueras, he attended the Escuela Nacional de Bellas Artes de San Fernando in Madrid intermittently between 1921 and 1926. In 1925 he had his first one-man show at the Galerías Dalmau in Barcelona. Early influenced by futurists, cubists, and the Italian "metaphysical" painters, Giorgio di Chirico and Carlo Carrà, he cast his lot with the surrealists of Paris in 1929. Soon he became one of the leading and most spectacular exponents of the school and the head of an international reaction against abstract art.

In contrast to the radicals of the surrealist school (see SURREALISM), Dali demanded a more consciously objective presentation. Basically, he attempted to create in pigments the images suggested by dreams or hallucinations. *Persistence of Memory* (1931), depicting limp watches draped over various objects, is the best known of Dali's and perhaps of all surrealist paintings.

His canvases exhibit excellent draughtsmanship and a skillful use of color. He makes frequent use of double or repeated images and such iconographical devices as the praying mantis, grasshoppers, keys, crutches, flesh and bread. Although controversy rages over the significance of Dali's work, almost all critics acknowledge his technical virtuosity.

In addition to his activities as a painter, Dali has created several ballets; made scenery and costumes for others; and designed fashions, patterns for silk fabrics, jewelry, furniture, glass and china. He also has worked in the fields of commercial art and book illustration (*Don Quixote*, *Macbeth*, *Montaigne's Essays*, and *Cellini's Autobiography*).

He collaborated in preparing scenarios for two significant surrealist motion pictures, *Un Chien Andalou* (1929) and *L'Age d'Or* (1931). His other writings include books of poetry and essays, a novel entitled *Hidden Faces* (1944), his autobiography, *The Secret Life of Salvador Dali* (1942) and *Fifty Secrets of Magic Craftsmanship* (1948). (See also PAINTING—Surrealism; THEATER—Symbolism).

Consult Soby, James Thrall, *Salvador Dali* (New York 1946).

DALIN, dā-lēn', Olof von, Swedish historian and poet: b. Vinberg, Holland, Aug. 29, 1708; d. Drottningholm, Aug. 12, 1763. He studied at Lund, and was given a minor public office at Stockholm in 1726. He began to publish the weekly *Svenska Argus* anonymously in 1733. This was followed by *Tänkar öfver Critiques* (*Thoughts About Critics*) in 1736; *The Story of the Horse and Aprilvråk*, a series of political satires (1738); and *Svenska Friheten* (*Swedish Liberty*, 1742). He then received a series of appointments, first as tutor to the crown prince (1751), and then as secretary of the Swedish Academy of Literature (1753). During a short period of political exile (1756–1761) he wrote his most famous work, *Svea Rikes historia* (*History of the Swedish Kingdom*), which was published in three volumes (1746–1762). He was ennobled

in 1751, was made privy councillor in 1753, and remained at court as royal historiographer until his death. Besides the works already mentioned, he wrote several minor dramatic works and numerous poems and epigrams.

DALKEITH, dāl-kēth', burgh, Scotland, Midlothian County, six miles southeast of Edinburgh. It has a corn market, a large and commodious market hall, erected in 1854; manufactories of carpets, brushes, and bricks, besides brass foundries and tanneries. There are large coal mines nearby. Much truck gardening for Edinburgh is carried on in the neighboring country. Dalkeith arose around an ancient castle, which was long a stronghold. It was successively held by the Grahams, the Douglasses, the earls of Morton and the earls of Buccleuch. Dalkeith Palace, the chief seat of the duke of Buccleuch and Queensberry, designed in 1700 by Sir John Vanbrugh on the site of the old castle, is a large square structure overhanging the North Esk. Several English rulers have occupied the palace on visits to Scotland. Pop. (1951) 8,786.

DALL, dōl, **William Healey**, American naturalist: b. Boston, Mass. Aug. 21, 1845; d. Washington, D.C., March 27, 1927. He studied zoology as a special student under Louis Agassiz at Harvard University, and from 1865 to 1868 accompanied the Western Union telegraph expedition to Alaska as its scientific specialist. There he collected valuable zoological specimens and in 1870 published *Alaska and Its Resources*, for many years the accepted authority on Alaska. His next Alaskan assignment was with the United States Coast Survey in charge of a scientific survey of the Aleutian Islands (1871-1884). In 1884 he was transferred to the United States Geological Survey in Washington, D.C. as a paleontologist, a post he held until his retirement in 1923. He became an authority on mollusks, chiefly of the Pacific Coast.

DALLAS, dāl'ās, **Alexander James**, American statesman: b. Jamaica, W. I., June 21, 1759; d. Philadelphia, Pa., Jan. 16, 1817. He was educated at Edinburgh, studied law in London and settled in Philadelphia in 1783. His legal practice flourished there and he received his first political appointment in 1791 when he was named secretary of the Commonwealth of Pennsylvania. He held this office through four gubernatorial administrations, until 1801. At the same time he began publishing his still standard reports of early United States Supreme Court decisions (1790-1807). From 1801 to 1814 he served as United States district attorney for the eastern district of Pennsylvania, and in 1814 President James Monroe appointed him secretary of the treasury.

Dallas came to office at a highly critical period in government finance. The treasury was bankrupted by the War of 1812, and there was no definite financial policy to guide it back to solvency. When he resigned in 1816, public credit had been restored, his recommendations for a second national bank had become law, and his heavy taxation measures had brought the treasury an operating surplus of some \$20,000,000.

Dallas also served as acting secretary of war during Monroe's illness in 1815.

Consult Dallas, George M., *Life and Writings of Alexander James Dallas* (Philadelphia 1871); Walters, Raymond, *Alexander James Dallas* (Philadelphia 1943).

DALLAS, George Mifflin, United States vice president and diplomat: b. Philadelphia, Pa., July 10, 1792; d. there, Dec. 31, 1864. He was the son of Alexander J. Dallas (q.v.). He graduated from Princeton University in 1810, was admitted to the bar three years later, and saw minor diplomatic service abroad in the peace negotiations after the War of 1812. An active Democrat, he soon became a leader in Pennsylvania politics. His numerous offices included mayor of Philadelphia; United States district attorney for eastern Pennsylvania (1829-1831); United States senator (1831-1833); and attorney general of Pennsylvania (1833-1835). President Martin Van Buren named him minister to Russia in 1837, a post he held for two years.

In 1844 he was elected vice president of the United States on the Democratic ticket along with President James K. Polk. A dramatic moment in his term as presiding officer of the Senate came in 1846, when, out of loyalty to his party's platform, he cast the deciding vote for the low tariff Walker Bill, although as a Pennsylvanian he was himself a high tariff advocate.

Dallas also served as United States minister to Great Britain from 1856 to 1861. On this mission he laid the foundations for settling Anglo-American difficulties in Central America resulting from the Clayton-Bulwer Treaty of 1850. He also secured from Great Britain a disavowal of the right of search in connection with a joint agreement for suppressing the slave trade.

His writings include *A Series of Letters from London* (1869); *The Life and Writings of Alexander James Dallas* (1871); and a *Diary* (1892), all published posthumously.

DALLAS, town, Georgia, county seat of Paulding County, about 30 miles northwest of Atlanta. Dallas is in an historic area as nearby at New Hope Church, Pickett's Mills, Pumpkin Vine Creek, and other tiny communities, there was continued fighting between the Union forces and the Confederates from May 25 to May 29, 1864. The chief agricultural products are cotton and corn and the manufactures include cotton yarn and hosiery. Pop. (1950) 1,817.

DALLAS, city, Oregon, Polk County seat, altitude 325 feet, on La Creole Creek; on the Southern Pacific Railroad, 15 miles west of Salem, and on state and federal highways. It has machine shops, ships lumber, tans leather, and dries and packs prunes. First settled in 1845, it was incorporated as a town in 1874, and became a city in 1901. It was named in honor of George M. Dallas, vice president during James K. Polk's administration. Pop. (1950) 4,793.

DALLAS, city, Texas, second largest city in the state after Houston; Dallas County seat, and port of entry; the industrial, commercial and financial center for much of the Southwest. Pop. (1950) 434,462.

Geography.—The city is situated in the northeastern part of the state, on the Trinity River, 33 miles east of Fort Worth; about 230 miles northwest of Houston, and about 75 miles south of the Oklahoma state line; altitude, 435 feet. The city's area is 112 square miles. Its climate is moderate, with a mean annual temperature of approximately 66°F. Winters are generally mild; January normal, 45°F. Summers are hot; July normal, 84°F. Summer nights are usually cooled by

prevailing breeze from the Gulf of Mexico. Average annual precipitation is about 36 inches, approximately 35 per cent of which falls in April, May, and June; the remainder is distributed rather evenly through the other months. The city is in the heart of the fairly flat and fertile blacklands belt of the state. The growing season is approximately 250 days; average date of last killing frost is March 18; of first killing frost, November 23. Cotton is the leading crop of the area, but diversification has developed rapidly since 1930. Dairying and the production of corn, wheat, oats, hay, vegetables, fruits, poultry, cattle, and hogs have increased in importance. The city is in the geographic center of the vast midcontinent oil and gas fields.

Population.—Total population of Greater Dallas (1950) was 470,142, including the separately incorporated island cities of Highland Park and University Park. About 98 per cent of the people are native born. Approximately 14 per cent are Negro. Home ownership exceeds 56 per cent. Within a few miles of the city are the towns of Grand Prairie, Garland, Irving, Carrollton, and Richardson, many of whose residents are employed in Dallas. The population (1950) of the metropolitan district was 614,799.

Transportation and Communication.—Dallas is on a network of modern state and federal highways, with motorbus and truck transportation in all directions. It is an important center of rail transportation, served by eight railroads: the Texas and Pacific; the Missouri-Kansas-Texas; the Chicago, Rock Island and Pacific; the Southern Pacific; the Fort Worth and Denver City; the St. Louis Southwestern; the Santa Fe-Texas; and the St. Louis, San Francisco and Texas. Major airline service is provided at Love Field by American Airlines, Delta Airlines, Braniff International Airways, Pioneer Air Lines, and Trans-Texas Airways. Within a few miles of the city are Hensley Field (U.S. Air Force Base) and a naval air station. In 1950 Dallas had seven radio and two television broadcasting stations and two daily newspapers: *The Dallas News* (weekday morning circulation 163,212), and *The Daily Times Herald* (average weekday evening circulation 140,534).

Commerce and Industry.—The city is primarily a distribution, finance, and insurance center. Diversified manufacturing is growing steadily, however. More than half of the working population are engaged in wholesale, retail, and service occupations; about one fifth are in manufacturing. Dallas ranks among the foremost cotton markets of the world, the Dallas Cotton Exchange normally handling over 2,000,000 bales of cotton per season. It is the home of the 11th District Federal Reserve Bank. Dallas occupies a central, strategic position in the heart of a great petroleum and natural gas producing region. Many major oil, and oil supply and equipment, companies have their executive offices in Dallas because of its financial importance and its attractions as a residential city. Its prominence as a distribution center with extensive warehouse space and highly developed transportation facilities has caused numerous national concerns to maintain branches in Dallas. The city ranks first in the Southwest and fourth in the nation in volume of insurance business. In 1950, Dallas was the headquarters of 43 insurance companies. The city's principal manufactures were cotton gin

and oil well machinery, wearing apparel, leather and saddle goods, cottonseed products, roofing materials, textiles, furniture, cement, processed food, paint, and showcase and display equipment. Printing and publishing and automobile assembling had assumed positions of importance, also.

Education.—Dallas has many educational and cultural institutions. The city maintains a modern public school system. There are various private and parochial schools. Institutions of higher learning are Southern Methodist University, Baylor University College of Dentistry, and the Southwest Medical College of the University of Texas, all coeducational. Others are Hockaday School, a girls' fully accredited junior college, college preparatory, and lower school; and the non-denominational Dallas Theological Seminary for men. Unique is the Civic Federation, sponsoring public opinion forums, young artists' competitions, chamber music programs, and adult education. Dallas has an active Little Theater, winner of the Belasco Cup in three successive national competitions. During the summer, light opera and musical comedy are presented over a ten-week period in the amphitheater at Fair Park. The Dallas Symphony Orchestra ranks among the nation's best. Noteworthy museums are the Dallas Museum of Fine Arts, housing old masters, contemporary Texas paintings, and sculpture; the Dallas Museum of Natural History with collections of Texas birds, mammals, fossils, and illustrations of the geography and plant life of the Southwest; the Museum of History of the Dallas Historical Society, containing collections of Texana—manuscripts, maps, household and personal effects, tools and implements of early Texas settlers; the noteworthy Dallas Health Museum, telling the story of human growth and development by dioramas, models, specimens, slides, films, and exhibits, and promoting good health and disease-prevention in terms the layman can understand; the Dallas Aquarium, containing more than 5,000 specimens of fish and marine life.

Parks and Recreational Facilities.—The city has several thousand acres of parks, playgrounds, and recreational centers. Foremost is Fair Park, site of the vast permanent exposition plant of the State Fair of Texas, largest state fair in the United States. Included are the Texas Hall of State, erected to commemorate the centennial of Texas independence; numerous exhibition halls, a large auditorium; the Civic Center; and the Cotton Bowl stadium, seating over 75,000. White Rock Lake Park, comprising 2,500 acres, contains a lake covering 1,350 acres. The city zoo is at Marsalis Park. Burnett Field is the home of the Dallas Eagles, Texas League baseball team. Outstanding sports events held annually in Dallas are the Cotton Bowl Football Classic, the Southwestern Sports and Vacation Show, sail-boat and speed-boat races, and golf and tennis tournaments.

Government.—The city government operates under the council-manager form, adopted in 1931 in place of the commission type that had been used since 1907. The complete electorate elects nine councilmen, six of whom represent districts and three are at-large. The city auditor is chosen by the presidents of the banks belonging to the Dallas Clearing House Association to approve purchase prices and provide nonpolitical control of municipal finances. Modern health, fire, police, welfare, park, and public works departments are maintained. The water system is municipally

owned and operated and the water supply comes from Lake Dallas, Grapevine Lake, and Garza—Little Elm Lake. The Dallas Housing Authority is a separate corporate entity owning and operating low-rent housing projects. The public libraries are controlled by a self-perpetuating board of trustees. The public school system is operated independently of the city government. Municipal employees in classified service are chosen under civil service procedure. In 1945, a master plan of civic development was adopted to enable the city to keep pace with its rapid growth. Dallas is a regional center for numerous federal government agencies.

History.—The site of the city of Dallas was first settled in 1841 by John Neely Bryan, a native of Tennessee, and frontier lawyer and trader. He had come on horseback from Arkansas, where he had resided and engaged in the sale of goods for several years, intending to establish a trading post on the upper Trinity River. He erected a one-room log cabin (now restored) on the east bank of the river on what is today the courthouse lawn. The site was part of the land grant known as Peters Colony, which had been made to William S. Peters and associates by the Republic of Texas to encourage settlement of the area. Soon Bryan was joined by Capt. M. Gilbert who brought his family by canoe down the Trinity, and by the John Beeman family who came by wagon. In 1846, a village was laid out, which upon the organization of Dallas County the same year, became the county seat, both being named Dallas, in honor of George Mifflin Dallas (q.v.), then vice president of the United States. Dallas was incorporated as a town in 1856, and chartered as a city in 1871. With the arrival of the Houston and Texas Central Railway in 1872 and the Texas and Pacific in 1873, followed by the entry of several other railroads within a relatively short period, the city began to make rapid progress. Its population, about 3,000 in 1872, rose to 38,067 by 1890. In 1886, the State Fair of Texas (which has played an important role in the development of the city), was launched, beginning as two rival fairs, which the following year were consolidated into the Texas State Fair and Dallas Exposition. Before 1900, Dallas was advancing steadily as a commercial, financial, and industrial center, while culturally it was keeping pace with its economic development. Dallas was the scene of the Texas Centennial Exposition in 1936, of the Pan American Exposition in 1937, and in 1941 the city celebrated the centennial of the first settlement of the site by Bryan.

Bibliography.—Lindsley, Philip, *A History of Greater Dallas and Vicinity*, 2 vols. (Chicago 1909); Jones, Ted., *Dallas: Its History, Its Development, Its Beauty* (Dallas 1925); Cochran, John H., *Dallas County: A Record of Its Pioneers and Progress* (Dallas 1928); Wallis, Clyde V., *The Southwest Market and Dallas* (Dallas 1930); Chamber of Commerce, *The Dallas Southwest* (Dallas 1942); Dallas City Plan Commission, *A Master Plan for Dallas* (St. Louis 1945); Barney, Robert O., *The Romantic Story of Dallas* (Dallas 1948); *The Texas Almanac* (Dallas annually).

ARTHUR A. SMITH,
Professor of Economics, Southern Methodist University.

DALLES, dälz, **The**, or **DALLES CITY**, Oreg., city and Wasco County seat, altitude 98 feet, on the Columbia River, the Union Pacific Railroad, 72 miles east of Portland, on state and federal highways. It is the eastern terminus of a 200-mile waterway from the sea, opened by

completion of the Bonneville dam and lock, in 1938. It has an airport, with airline service. Located in an agricultural area, The Dalles is an important trading center. It has railroad shops, flour and lumber mills, and canneries. Salmon packing is a leading industry, and fruit, grain, meat, and wool are shipped. The federal building, the city hall, the courthouse, and the civic auditorium, a World War I memorial, are loosely grouped. A few blocks away is the building constructed in 1868 as a mint; it was sold by the government when the expected production of gold failed to materialize. First settled about 1840, the municipality was incorporated in 1858, as Fort Dalles. The name was later changed to Dalles City, but the postal listing, The Dalles, is the name commonly used. It has a mayor and council and city manager. The water supply system is under municipal ownership. Pop. (1930) 5,883; (1940) 6,266; (est 1950) 7,384.

DALLIN, Cyrus Edwin, American sculptor: b. Springville, Utah, Nov. 22, 1861; d. Boston, Mass., Nov. 14, 1944. In his native West he came into close contact with Indian life, in the realistic and impressive portrayal of which he excels all other artists. He studied under Truman Bartlett in Boston and under Henri Michel Antoine Chapu in Paris, where Buffalo Bill's Wild West Show inspired the *Signal for Peace* (1890) which received a gold medal at the Chicago Exposition and is now in Lincoln Park in that city. It was the first of a group of four companion pieces. The others are *The Medicine Man* (Philadelphia); *The Protest* (not made permanent); *The Appeal to the Great Spirit* (Boston)—all given medals at the Paris salons. Other works are the marble statue of Sir Isaac Newton in the Congressional Library at Washington; *Don Quixote*, which received a gold medal at the St. Louis Exposition of 1904; the monument to the pioneers in Salt Lake City; *Statue of Massachusetts* (Plymouth, Mass., 1921) and *The Spirit of Life* (Brookline, Mass., 1928).

Consult Hodge's "Dallin the Sculptor" (*American Magazine of Art*, 1924).

DALMAN, däl'man, **Gustaf Hermann**, German Lutheran scholar: b. Niesky in Silesia, June 9, 1855. He was educated among the Moravians and was graduated from their theological school at Gnadefeld. Here he was professor of the Old Testament and practical theology 1881–1887. In 1887 he left the Moravians and joined the Lutherans and the same year received the degree of Ph.D. at Leipzig University. For the next 15 years he was a professor and finally the director of the Institutum Delitzschianum at Leipzig. In 1890 he became associate professor of Old Testament Exegesis in the University of Leipzig. In 1902 he was granted a furlough and served as director of the German Evangelical Archaeological Institute in Palestine. Following 1917 he was professor in Greifswald in charge of an institute for Palestine Research named after him. He has written many volumes in the fields of theology, several of which have been translated into English. He wrote *Christianity and Judaism* (German 1898; English 1901); *The Words of Jesus Considered in the Light of Post-Biblical Writings and the Aramaic Language* (Edinburgh 1902); *Arbeit und Sitte in Palestina* (1924). He is a deep student of Aramaic and issued a

grammar of the language in 1894. It has not been translated into English.

DALMATIA (Slav. DALMAČIJA), since 1945 a province of the People's Republic of Croatia (Yugoslavia). Dalmatia is triangular in shape and extends for 350 miles along the eastern shore of the Adriatic Sea, from 44° 6' to 42° north latitude, with an average inland depth of 30 miles. Due to the many bays and coves along the sea-coast the length of the province's shore line is nearly trebled (974 miles). The province has an area of 4,586 square miles (in its historical frontiers, 5,004 miles) and a population of 664,000 (census of May 1951), of whom 82 per cent are Croats, 17 per cent Serbs, and 0.5 per cent Italians. The capital city is Split (Spalato), the second most important Yugoslav port (after Rijeka), with a population of 75,000 (census of March 1953). Other large towns, with their March 1953 populations, are Zadar (Zara), the old capital, 20,000; Šibenik, in northern Dalmatia, 22,000; Dubrovnik (Ragusa), the world-famous tourist center, 18,000; Trogir (Traù), 5,000; and Knin, an important railroad junction, 3,000.

Topography and Climate.—Except for a narrow stretch of lowland along the shore and a few high plains, the country is mountainous. Numerous islands, varying in size and having a total area of approximately 1,000 miles, are located along the coast. The most important among these, from north to south, are: Silba, Dugi Otok, Murter (Morter), Brač (Brazza), Hvar (Lesina), Korčula (Curzola), Vis (Lissa), Lastovo (Lagosta), and Mljet (Meleda). The climate on the coast and on the islands is Mediterranean, and in the hinterland continental.

Economic Life.—The principal occupations of the population are agriculture and fishing, only 20 per cent of the people being employed in industry and in mining, or living in towns. The land distribution is as follows: arable land and truck gardens, 14 per cent; vineyards, 6.6 per cent; pastures, 48.6 per cent; and forests, 30.6 per cent. The available arable land is insufficient to fulfill food requirements, and in normal conditions 100,000 tons of wheat must be imported yearly, thus branding Dalmatia, insofar as the food-supply situation is concerned, as one of the "passive regions" of Yugoslavia. The main product is wine, with an average yield of 1.2 million hectoliters per annum, of which about 200,000 hectoliters are exported abroad. Olive-oil production, second in importance, amounts to 90,000 hectoliters yearly. Other outstanding agricultural products are: early spring vegetables; various types of fruits; and two medicinal plants, pyrethrum, an insecticide, whose production is 1,500 tons yearly, and rosemary, used mostly for oil extraction, with an annual output of 40,000 pounds of oil.

In mining and industry the first place goes to bauxite, with a production of 500,000 tons yearly. A large aluminum processing plant has been erected at Lozovac near Šibenik. Also of importance are the cement factories at Sućurac near Split, and cyanamide factories at Šibenik and Omiš. The marble quarries on the islands of Brač and Korčula are famous throughout Europe. Fishing is excellent all along the coast, and fish canneries are located in Zadar, Komiža (on Vis island), Velutka (on Korčula island), and Šibenik. Dalmatia is a world-famous tourist attraction.

History.—The early inhabitants of Dalmatia were Greeks, Illyrians, and Dalmatians, and in the third century B.C. the Illyrians succeeded in establishing an independent state. From that time until the year 12 A.D., when Dalmatia was eventually conquered and incorporated into the Roman Empire, the Illyrians, Dalmatians, and Greeks were continually struggling against Roman penetration. The arrival of the Slavs, Croats, and Serbs on the Balkan Peninsula and the subsequent disintegration of the Roman Empire marked the beginning of a new era in the Dalmatian history. While the towns remained inhabited by the Romans, the countryside was soon populated by the newcomers, who thus became a large majority of the population. In fact, it was in Dalmatia that in the 10th century (925 A.D.) the Croatian Kingdom under Tomislav was established, and for this reason the province is known as the cradle of Croatian history. After the personal union between Croatia and Hungary had been concluded in 1102, for more than three centuries, until 1420, Dalmatia was a part of the Hungaro-Croatian kingdom—though it was often subjected to the independent rule of the Croatian Dukes of Bribir. Beginning in the middle of the 14th century, the Republic of Venice attempted to subjugate Dalmatia, and was successful in gaining a large part of it through purchase from King Ladislas of Naples in 1409 for 100,000 ducats. But it was not until 1420 that Venice conquered the rest of Dalmatia, except from the Republic of Ragusa in the south, which remained, as heretofore, an independent republic.

The Venetian rule of almost four centuries, although exerting a significant cultural influence, was unable to change the national character of the population; and when, in 1797, the Austrian army under Gen. Matija Rukavina, a Croat by nationality, took possession of Dalmatia, the initial requests were made by the people's representatives for a union with Croatia. From 1805 to 1813 Dalmatia was a part of the French Empire and was incorporated into the Province of Illyria; but after the downfall of Napoleon I. Austria regained its possession and held it until 1918. During this era Dalmatia was a province in the Austrian half of the Dual Monarchy. The Croatian national revival was marked by the appearance of the first Croatian newspaper, *Zora Dalmatinska*, in Zadar, in 1844. During the second half of the 19th century the people of Dalmatia were continually struggling to reaffirm the Croatian character of the country, and to achieve political unification with Croatia. Austrian governments attempted to check these tendencies and supported openly the Italianophile and autonomous elements, but in the last decades of the 19th century the Croatian character of Dalmatia became undisputed in all aspects of public life. However, Austria would not permit Dalmatia's unification with Croatia. In the last pre-World War I elections, in 1911, Croatian and Serbian groups elected all 11 deputies to the Vienna Parliament, whereas the Italians could not elect a single deputy.

Most of Dalmatia was finally united with Croatia in 1918, thus becoming a part of Yugoslavia, and was incorporated into the Banovina of Croatia in 1939. By the Rome Protocols of May 18, 1941, a very large portion of the Dalmatian territory had to be ceded to Italy, but after the Italian collapse of 1943 these regions were an-

annexed by the Independent State of Croatia and subsequently incorporated in the new Yugoslavia.

BRANKO M. PEŠELJ,
Associate, Mid European Studies Center.

DALMATIAN DOG. See Dog.

DALMATIC, dāl-măt'ik, an ecclesiastical vestment worn principally by priests of the Roman Catholic Church when they are acting as deacons or subdeacons at Mass or in solemn processions or benedictions of a nonpenitential nature. Bishops wear it when they are officiating at solemn pontifical Mass. The garment was worn originally in ancient Dalmatia, and came into general use among Romans probably during the 2d century A.D., when it was worn as a loose, wide-sleeved tunic covering the *tunica alba*. The *Liber Pontificalis* indicates that it was Pope Sylvester I (314–335) who first used the Roman *dalmatica* as a church vestment. For several centuries thereafter it was worn by the pope and by Roman deacons, and by others only with papal permission. Its use was extended later, and by the 11th century all priests were allowed to wear it. As it is worn today in Italy, the garment is tunic-like, with wide sleeves; outside of Italy the sleeves are slit underneath, two pieces of the vestment descend from the shoulders over the upper arms, and the general appearance is that of a mantle. The original length has been much reduced. The old ornamenting devices, the *clavi*, survive as two vertical stripes extending from shoulder to hem and connected by a cross-band varying in position. The fabric, once of linen or wool, is not regulated, but silk is common. The color must correspond to that of the chasuble. A garment resembling the ecclesiastical one and bearing the same name is worn by British monarchs when they are crowned.

DALMELLINGTON, dāl-mě'ling-tūn, civil parish, Scotland, located in Ayre county, 15 miles southeast of Ayre. It is the terminus of a branch line of the London, Midland and Scottish railway, and has coal mines and ironworks. It was prominent during the Covenanting period. Pop. (1951) 7,094.

DALMORES, dāl-mō'rēs', **Charles**, French operatic tenor: b. Nancy, Department of Meurthe-et-Moselle, France, Dec. 31, 1871; d. Hollywood, Calif., Dec. 6, 1939. He studied the horn at conservatories in Nancy and Paris, and in 1894 became professor of horn at the Lyons conservatory. After receiving vocal training at Lyons, he made his operatic debut at Rouen (1899). He sang for several seasons at Théâtre Royal de la Monnaie, Brussels, and at Covent Garden, London. In 1906 he went to the Manhattan Opera House, New York City, and sang there until 1910. He was with the Chicago Opera Company from 1910 until 1918. His principal roles included Julian in *Louise*.

DALNY. See DAIREN.

DALOU, dāl'loo', **Jules**, French sculptor: b. Paris, Dec. 31, 1838; d. there, April 15, 1902. He studied under Jean Baptiste Carpeaux and, at the École des Beaux-Arts, under Francisque Joseph Duret. Involvement with the Commune in 1871 forced him to leave Paris and find refuge in London. He taught sculpture at South Ken-

sington. In 1879 he returned to Paris and remained there until his death. His many works, combining in technique the best elements of his teachers' techniques, include *Triomphe de la République* (Place de la Nation, Paris), a large allegorical monument; *Le Triomphe de Silène* (Jardin du Luxembourg, Paris), suggestive in sculpture of a mythological painting by Peter Paul Rubens; a monument to Ferdinand Victor Eugène Delacroix (Jardin du Luxembourg, Paris); and a large bas-relief of the Constituent Assembly of June 23, 1789 (Palais Bourbon, Paris). The monument to labor on which Dalou worked in his last years was to have taken a completely naturalistic form; only the models of various kinds of workers were finished.

DALRIADA, a name borne by two ancient Gaelic kingdoms, one of them in Ireland and the other in Scotland. The Irish kingdom was located in what is now the northern part of County Antrim, and was inhabited by Gaels (known to the Romans as Scoti). In 470 Fergus Mac Erc, prince of Dalriada, accompanied by his three brothers, crossed the North Channel and established the kingdom of Argyll ("the eastern Gael"), or Scottish Dalriada, in what is now Argyllshire. Scottish Dalriada remained a sub-kingdom of Irish Dalriada until 575, when, on the advice of Saint Columba, it was given its independence under King Aidan. Kenneth Mac-Alpine, a successor to Aidan, brought the southern Picts under his rule in the middle of the 9th century.

DALRYMPLE, dāl-rīm'p'l, the name of a prominent Scottish family, descended from one of the Lollards of Kyle who followed John Wycliffe.

SIR JAMES DALRYMPLE, 1ST VISCOUNT STAIR, lawyer and statesman: b. Carrick, Scotland, May 1619; d. Edinburgh, Nov. 25, 1695. From 1641 to 1647 he was a regent of the University of Glasgow, and in 1648 he was admitted to the Scottish bar. He served as secretary to the commission sent by parliament in 1649 to treat with Charles II at the Hague, and as secretary to the commission which, at Breda in 1650, secured Charles' agreement to return to Scotland. A judge of the court of session from 1657 to 1660 and, again, beginning in 1661, he became court president in 1670. He sat in the Scottish parliaments of 1672 and 1673–1674. Adverse to the severe measures against the Covenanters, he excited the enmity of the Duke of York (later James II of England, Scotland, and Ireland), and lost his judicial appointment. In 1682 he retired to Holland. He became a favorite of William III, Count of Nassau, and accompanied him to England when he acceded to the British rule. In 1689 Dalrymple returned to the presidency of the court of session, and in 1690 he was created Viscount Stair. Among his published works is the monumental *Institutions of the Law of Scotland* (1681). His daughter, Janet, is the heroine of Sir Walter Scott's *The Bride of Lammermoor*.

SIR JOHN DALRYMPLE, 1ST EARL OF STAIR, lawyer and statesman: b. 1648; d. Jan. 8, 1707. The eldest son of Sir James Dalrymple, 1st Viscount Stair, he was called to the Scottish bar in 1672. Under Charles II he was twice imprisoned for not sufficiently enforcing the persecuting acts, but under James II he served as king's advocate

in Scotland (1686–1688) and became lord justice-clerk (1688). He furthered the 1688 revolution in Scotland, and in 1691 became William III's joint secretary of state. The blame for the massacre of the Macdonald clan at Glencoe in 1692 was laid chiefly to him, with the result that in 1695 he resigned. Under Queen Anne he became a privy councillor (1702) and was created earl (1703). He sat with the commission appointed in 1760 to bring about union of England and Scotland.

SIR JOHN DALRYMPLE, 2D EARL OF STAIR, general and diplomat: b. Edinburgh, July 20, 1673; d. there, May 9, 1747. He was the second son of Sir John Dalrymple, 1st Earl of Stair. At the age of eight he accidentally killed his elder brother, and was thereafter exiled by his parents. He studied at Leiden University, entered the Cameronian Regiment in 1692, and in 1701 was appointed a lieutenant colonel of the Scotch regiment of foot guards. He became aide-de-camp to John Churchill, 1st Duke of Marlborough, in 1703, and distinguished himself in the latter's campaigns. On the accession of George I (1714) he was appointed a privy councillor, and gave invaluable information in the dispatches he sent as minister plenipotentiary (1715–1719) and ambassador (1719–1720) to France, where he drew attention by the splendor of his retinue. In retirement thereafter, he became a noted agriculturist and rural economist, but after helping to secure the overthrow of Sir Robert Walpole he returned to public life. He was made a field marshal and named governor of Minorca in 1742, served under George II at Dettingen in 1743, and in 1746 was appointed general of marines.

SIR DAVID DALRYMPLE, LORD HAILES, lawyer and antiquarian: b. Edinburgh, Oct. 28, 1726; d. Nov. 29, 1792. He was the grandson of the youngest son of Sir James Dalrymple, 1st Viscount Stair. A graduate of Eton, he received legal training at Utrecht, and was admitted to the bar in 1748. In 1766 he became a judge of the court of session, receiving at the same time the title of Lord Hailes, and in 1776 he became a judge of the justiciary or criminal court, where he was known for humaneness. He was a friend of such men as Samuel Johnson, James Boswell, and Edmund Burke. His chief work is the *Annals of Scotland* (1776–1779), a factual chronicle covering the period from the 11th to the 17th century.

ALEXANDER DALRYMPLE, hydrographer: b. New Hailes, near Edinburgh, July 24, 1737; d. London, England, June 19, 1808. He was the younger brother of Sir David Dalrymple, Lord Hailes. In 1753 he arrived at Madras, India, as a writer in the service of the East India Company. He voyaged among the Lau Islands from 1759 until 1762. In 1779 he became hydrographer to the East India Company, and later, from 1795 to 1808, held the newly established post of hydrographer to the admiralty, in which office he developed the publication of admiralty charts. He was the author of *Account of Discoveries in the South Pacific Ocean before 1764* (1767), *Historical Collection of South Sea Voyages*, 2 vols. (1770–1771), and *Historical Relation of the Several Expeditions from Fort Marlborough to the Islands off the West Coast of Sumatra* (1775).

DALSGAARD, dals'gór, Christen, Danish genre painter: b. Krabbesholm, near Skive, Denmark, Oct. 30, 1824; d. Sorö, Feb. 11, 1907. He

studied at the Copenhagen Academy. In 1862 he became professor of drawing at the Academy of Sorö, and in 1872 he was elected to the Copenhagen Academy. His dramatic paintings of scenes out of Danish folk life show a keen sense of observation. Outstanding among the various paintings by Dalsgaard which are at Copenhagen is *Seizure for Debt* (1860). The Aarhus Museum has *The Farewell* (1860).

DALTON, dól't'n, John, English chemist and physicist: b. Eaglesfield, near Cockermonth, Cumberland, England, Sept. 6, 1766; d. Manchester, England, July 27, 1844. The son of a poor weaver, he was educated at the Quakers' school in his native town and spent 12 years thereafter teaching school at Kendal, first (1781–1785) as an assistant and later (1785–1793) as comaster with his brother Jonathan. At Kendal he undertook private study in natural philosophy and mathematics, and began, in 1787, the journal of meteorological observations which he was to continue keeping until his death, by which time he had recorded 200,000 observations. He went to New College, Mosley Street, Manchester, in 1793 as a professor of mathematics and natural philosophy, and remained in that position until 1799, after which he did private teaching and, later, lecturing. His *Meteorological Observations and Essays* (1793; 2d ed. 1834) put forth the hypothesis that the aurora borealis was purely electrical in origin. In 1794, having become a member of the Literary and Philosophical Society of Manchester, he read to the society a paper giving the first detailed description of color blindness (q.v.). He laid the foundations of meteorology as a science and gained a European reputation with four papers—*On the Constitution of Mixed Gases*, *On the Force of Steam*, *On Evaporation*, and *On the Expansion of Gases by Heat*—which he read in 1801. A statement of Dalton's law (q.v.) was contained in a paper on the absorption of gases which he read in 1803 and which was published, with a table of atomic weights, two years later.

Dalton's publication of *A New System of Chemical Philosophy* (1808–1810; vol. 2, 1827), with its presentation of atomic theory (q.v.) and its more comprehensive tabulation of atomic weights, produced an important revolution in chemistry. The Royal Society in 1822 admitted him a member and in 1825 gave him its award for his development of atomic theory. In 1830 he became a foreign associate of the Académie des Sciences, of which he had been a corresponding member since 1816. He was elected a member of the Royal Society of Edinburgh, the Royal Academies of Science of Berlin and Munich, and of the Natural History Society of Moscow. His papers were published in the *Memoirs* of the Literary and Philosophical Society of Manchester (of which he was president, 1817–1844), in the *Philosophical Transactions* of the Royal Society, in William Nicholson's *Journal of Natural Philosophy, Chemistry, and the Arts*, and in Thomas Thomson's *Annals of Philosophy*. See also ATOMIC THEORY; COLOR BLINDNESS.

Consult Henry, William C., *Memoirs of the Life and Scientific Researches of John Dalton* (London 1854); Smith, Angus, *Memoir of Dr. Dalton and History of the Atomic Theory* (London 1856); Tilden, William A., *Famous Chemists* (New York 1921).

DALTON, John Call, American physiologist: b. Chelmsford, Mass., Feb. 2, 1825; d. New

York, Feb. 11, 1889. He was graduated at Harvard in 1844 and at Harvard Medical School in 1847. He was successively professor of physiology at the University of Buffalo, at the Vermont Medical School, at the Long Island College Hospital, and at the New York College of Physicians and Surgeons, of which he became president in 1883. He served as an army surgeon throughout the Civil War.

His published works include *Human Physiology* (1859); *Physiology and Hygiene for Schools, Families and Colleges* (1868); *The Experimental Method of Medicine* (1882); *Topographical Anatomy of the Brain* (1885).

DALTON, Robert, American desperado: b. probably Cass County, Mo., 1867; d. Coffeyville, Kans., Oct. 5, 1892. Appointed in 1888 a deputy United States marshal for service in Indian Territory, he soon resigned or was discharged. After killing a rival in a love affair he embarked on a career of horse-stealing and train robbery with his brothers Grattan and Emmet. The Dalton gang with two associates attempted to rob the two banks in Coffeyville, Kans., on the morning of Oct. 5, 1892. In a pitched battle with the townsmen Robert, Grattan, and their associates were killed. Emmet, severely wounded, was captured and served a long prison term.

DALTON, city, Georgia, and Whitfield County seat; altitude 775 feet; on the Southern; and Nashville, Chattanooga and Saint Louis railroads, 112 miles northwest of Atlanta. Situated in the foothills of the Cohutta Mountains, Dalton is a health resort. Iron, manganese, limestone and talc are found in the surrounding area. Dalton is widely known as the "bedspread capital of the world" with numerous factories making chenille and candlewick spreads. Hosiery, textiles, chairs, lumber, brick and tile, foundry and machine-shop products and jail equipment are also manufactured here.

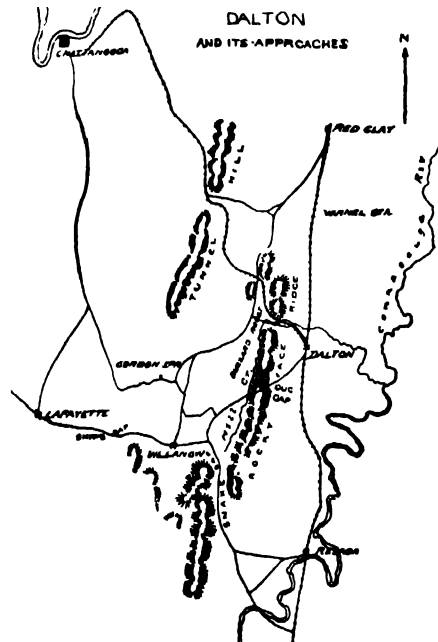
History.—The first settlement here in 1837 was incorporated as the village of Cross Plains. In 1847 it was chartered as a city and named Dalton for an early settler. In 1863–1864 it was the Confederate headquarters of Gen. Joseph E. Johnston, who wintered here in preparation for the coming struggle with Sherman over Atlanta. Government is by mayor and council. Pop. (1940) 10,448; (1950) 15,968.

MILITARY OPERATIONS AT DALTON

These operations, on Feb. 23–25 and May 8–12, 1864, included engagements at Buzzard's Roost Gap, Dug Gap, Rocky Face Ridge, Varnell Station. In the northwestern part of Georgia, where the Chattanooga and Atlanta Railroad is intersected by that from Cleveland, Tenn., by rail Dalton is 38 miles southeast of Chattanooga. When General Bragg was supposed definitely to have abandoned Chattanooga, Sept. 9, 1863, General Halleck ordered General Rosecrans to occupy Dalton, and here Bragg retreated after his defeat at Lookout Mountain and Missionary Ridge, Nov. 24–25, 1863. In February 1864 General Grant ordered General Thomas to seize the town. Thomas moved, reported that he could not carry the position, and the effort was abandoned. His movement cost the Union army about 300 killed and wounded, and the Confederates about 200.

Dalton, the first objective point of Sherman's Atlanta campaign, was held April 30, 1864, by

Gen. J. E. Johnston, with 54,000 men. The approaches to the place were difficult, and it was practically impregnable. Early in May, Sherman concentrated his grand army in and around Chattanooga for his Atlanta campaign. It was made up of the armies of the Cumberland, Tennessee and Ohio, commanded respectively by Gens. Geo. H. Thomas, J. B. McPherson and J. M. Schofield, aggregating 98,797 men and 254 guns. The Army of the Cumberland had about 60,000 men, the Army of the Tennessee 25,000, and the Army of the Ohio 14,000. On May 6 the Army of the Cumberland was at and near Ringgold, the Army of the Tennessee at Gordon's Mills, on the Chickamauga, and the Army of the Ohio near Red Clay, on the Georgia line, north of Dalton. The four corps of Thomas and Schofield were ordered to move on Dalton in front, while McPherson with two corps moved through Snake Creek Gap. On the 7th McPherson was ordered to march from Gordon's Mills through the Gap to Resaca, 18 miles south of Dalton. He



marched by way of Ship's Gap and Villanow, pushed through Snake Creek Gap, a wild defile, nearly six miles long, 15 miles south of Buzzard's Roost, and on the morning of the 9th drove back Grigsby's Kentucky cavalry brigade, and marched to within a mile of Resaca, then held by two brigades under General Cantey. Finding the place too strong to be assaulted, McPherson fell back to a strong position at the east end of the Gap. Meanwhile Thomas and Schofield had pressed forward. Thomas drove the Confederates in his front full through Buzzard's Roost Gap, and Schofield closed down on Thomas's left. On the 8th there was heavy skirmishing between Thomas and the Confederate divisions of Stewart and Bate at Buzzard's Roost and about six miles farther south a determined assault.

The road from Lafayette to Dalton passes through a cleft in the palisade, which had been deepened and widened, hence known as Dug Gap. Geary's division attacked this gap. Skirmishers were thrown out who drove those of the enemy

from the foot of the ridge and up the road nearly to the summit, when two brigades were formed in double lines on either side of the road. The Confederates were driven clear to the summit. The position of the Gap could not be carried, and an assault on the perpendicular palisade south of it was ordered, where it was broken by a few clefts through which four or five men could move abreast. The men charged, a few reached the summit, to be killed or captured, and the assault failed. After a short breathing-spell another effort was repulsed with much loss. Still another attempt was made by a single regiment, but it also failed. Everywhere the assault was repulsed, and the Federals withdrew after a loss of 306 killed and wounded, and 51 captured or missing. It is doubtful if the Confederate loss exceeded 30 men. At Varnell's Station Stoneman's and Wheeler's cavalry divisions had an engagement in which the loss was about 150 on each side, and Thomas pressed so vigorously in front of Buzzard's Roost that the heavy skirmishing attained the dimensions of a battle. By the 11th Sherman moved his army to pass through Snake Creek Gap. On the evening of the 12th Johnston was fully informed of the movement toward his rear, which had been covered by the ridge and the forests of the country, and he abandoned his position that night to give Sherman battle at Resaca. On the morning of the 13th Howard occupied Dalton. The Union loss around Dalton, May 7-12, was about 830 killed and wounded; the Confederate loss not more than half that number.

E. A. CARMAN.

DALTON, town, Massachusetts, in Berkshire County; altitude 1,199 feet; on the Boston and Albany Railroad, 5 miles east of Pittsfield. Beginning in 1801, papermaking has been the town's chief industry; and currency paper for the federal government has been manufactured here since 1846. It is governed by selectmen. Pop. (1940) 4,206; (1950) 4,772.

DALTON IN FURNESS, urban district, England, in Lancashire, 4 miles northeast of Barrow-in-Furness. In its vicinity are extensive iron works, rich hematite iron-ore mines, and the ruins of the magnificent abbey of Furness. Dalton Castle, an old tower in the town, was formerly associated with Furness Abbey. The painter Romney was born and buried here. It is connected with the Irish Sea by a canal three miles long. Pop. (1951) 10,394.

DALTONISM. See COLOR-BLINDNESS.

DALTON'S LAW, a principle discovered by the English physicist, John Dalton (q.v.), that in a mixture of gases which do not unite chemically, the pressure is equal to the sum of the pressures of all the gases in the mixture. See also PNEUMATICS.

DALY, Arnold (in full PETER CHRISTOPHER ARNOLD), American actor: b. Brooklyn, N. Y., Oct. 4, 1875; d. New York, N. Y., Jan. 13, 1927. In 1892 he made his debut in *The Jolly Squire*. Thereafter he appeared in many successful plays and in 1903 produced in New York Bernard Shaw's *Candida*. For the next six or seven years he appeared exclusively in Shaw's dramas *Mrs. Warren's Profession* (1905); *You Never Can*

Tell (1904); *Arms and the Man*, and *The Man of Destiny* (1906). In 1913 he appeared in Birmingham's *General John Regan*.

DALY, Charles Patrick, American jurist and author: b. New York, Oct. 31, 1816; d. Sept. 19, 1899. He had a distinguished judicial career in his native city, becoming justice of the Court of Common Pleas in 1844, first judge of the court in 1857 and chief justice in 1871, retiring on account of age in 1886. He was president of the American Geographical Society from its incipency until his death. His works include *First Settlement of Jews in North America*; *What We Know of Maps and Map Drawing Before Mercator*; *A History of Physical Geography*; *Historical Sketch of the Judicial Tribunals of New York* (1855).

DALY, John Augustin, American dramatist and theatrical proprietor: b. Plymouth, N. C., July 20, 1838; d. Paris, June 7, 1899. In 1869 he opened his Fifth Avenue Theatre on 24th Street, New York; and after its destruction by fire in 1873 he opened its successor on 28th Street. In 1879 he opened Daly's Theatre on Broadway. Among his original plays are *Divorce*; *Pique*; *Horizon*; *Under the Gaslight*. He also wrote: *Peg Woffington*, a *Tribute to the Actress and the Woman*.

DALY, Joseph Francis, American lawyer: b. Plymouth, N. C., Dec. 3, 1840; d. Yonkers, N. Y., Aug. 7, 1916. He studied law in New York and was admitted to the bar in 1862. He was a judge of the Court of Common Pleas 1870-1896 and chief justice of the same court in 1896. He became a justice of the State Supreme Court in 1896 and in 1900 was appointed by President McKinley commissioner to revise the laws of Puerto Rico. He was a member of the American Bar Association, the New York State Bar Association and the New York City Bar Association. He was one of the founders of the Players' Club and was its vice president for a time. He was also a member of the Catholic Club, of which he was president 1894-1899; and of many other societies.

DALY, Marcus, American miner and capitalist: b. Ireland, Dec. 5, 1841; d. Anaconda, Mont., Nov. 12, 1900. Emigrating to the United States at 15, he became a miner in California and Nevada. With associates he bought the Anaconda Silver Mine in Montana, later founding the Anaconda Copper Mining Company. A bitter foe of Senator William A. Clark (q.v.), he never sought political office.

DALYELL, or DALZELL OF BINNS, Thomas, Scottish soldier: b. about 1599; d. Aug. 23, 1685. He was taken prisoner fighting on the loyalist side at Worcester and afterward escaped to Russia, where he was made a general. Returning to England at the Restoration, he was made commander in chief of the forces in Scotland and made himself notorious for his ferocity against the Covenanters.

DALZELL, John, American lawyer: b. New York, April 19, 1845; d. Calif., Oct. 2, 1927. His family removed to Pittsburgh in 1847. He was educated at Yale and after studying law was admitted to the bar in 1867. He practiced law

in Pittsburgh and became counsel for several large and important western industries and railroad companies. A member of the House of Representatives from 1887 to 1912, Dalzell held many important committee posts and took a prominent role in the formation of Republican Party policy. As chairman of the powerful Rules Committee, he instituted many rules of procedure still used in the House. For several years Dalzell was also the ranking member of the Committee on Ways and Means, and one of the regents of the Smithsonian Institution.

DAM, dām, (Carl Peter) Henrik, Danish biochemist: b. Copenhagen, Denmark, Feb. 21, 1895. For his work on vitamin K, Dam was named joint recipient with Edward A. Doisy of the Nobel Prize in physiology and medicine for 1943. Educated at the Polytechnic Institute of Copenhagen, Dam spent his early career as a teacher and researcher at the Royal School of Agriculture and Veterinarian Medicine, Copenhagen, and at the University of Copenhagen. In 1940 he came to the United States to lecture and he remained until 1946, when he returned to the Polytechnic Institute in Copenhagen to assume the post of professor of biochemistry to which he had been appointed in 1941. While in the United States he was a senior research associate in the University of Rochester School of Medicine and Dentistry from 1942 to 1945, and after 1945 an associate member of the Rockefeller Institute for Medical Research. In 1934 he first published results of his early research on vitamin K, a substance concerned with the clotting of the blood. Dam's research work has been chiefly centered about vitamins, lipides, and nutrition.

DAMA, dā'mā, a genus of the deer family (Cervidae) comprising the common fallow deer (*Dama dama*) and the Persian fallow deer (*D. mesopotamica*). The genus is characterized by its palmated antlers. The name is also given to a species of large gazelle (*Gazella dama*) found in northern Africa including the Sudan. It is closely allied to the mohr (q.v.), which is often regarded as a subspecies of this gazelle though it has more white on the hindquarters.

DAMAGES, in law, consist of the compensation awarded by courts for losses and injuries sustained. The amount of damages is determined by the jury or other trier of fact, according to the circumstances of the particular case and subject to rules of law stated by the court. Further judicial control over damages is exercised through the court's power to order new trials where the damages are excessive or inadequate, or to provide that the entering of judgment on the verdict shall be conditional upon either a reduction or an increase in the verdict made with the consent of the plaintiff or the defendant, as the case may be.

Under the Anglo-American judicial system, the principle underlying damages is that the injured party ought to be compensated for the wrong done to him. Compensatory damages, in tort cases, are supposed to place the injured person as nearly as possible in the situation he would have been in had the wrong not occurred; in contract cases, they are aimed at allowing the plaintiff the advantages he would have enjoyed had the contract been performed. In special cases,

however, the law may allow nominal damages, even though no actual loss has occurred, or punitive damages, which exceed compensation for the injury suffered.

Nominal damages are trivial amounts awarded in recognition of the invasion of some legal right, rather than as a recompense for a loss sustained. In the case of an assault on the person, a libel, a malicious prosecution, or a trespass to real estate, for example, no measurable harm may be done, yet the court may allow the award of a small sum, such as six cents, merely as a recognition of the breach of a duty owed by the defendant to the plaintiff.

Punitive damages (also sometimes called exemplary or vindictive damages, or "smart money") are allowed in some types of cases in addition to compensatory damages. Their purpose is to give judicially sanctioned expression to a feeling of outrage caused by malicious wrongdoing, and to provide a deterrent to such misconduct. Examples of torts which may give rise to punitive damages are injuries to family relations, such as seduction or alienation of affections, injuries to reputation, and wanton injury or destruction of property. Oppressive conduct by public officials, common carriers, and public utilities may likewise provide the basis for exemplary damages. Breach of contract by persons other than public service enterprises, even though malicious, will not generally result in the recovery of such damages. Most courts will allow the jury to assess punitive damages, where appropriate, because of an aggravated wrong, even though the plaintiff is unable to show substantial actual injury.

Compensatory damages are allowed, in tort cases, if the plaintiff can show that his loss or injury resulted directly from the wrongful act or omission of the defendant. In cases of intentional wrongdoing, the range of responsibility for remote consequences is relatively broad; but where the basis of the cause of action is negligence, the liability of the wrongdoer is likely to be more strictly limited to the foreseeable results of his conduct. In personal injury cases, some of the elements to be considered in the assessment of damages, once the existence of liability has been established, are medical expenses, pain and suffering, and impairment of future earning power. Under modern law, a cause of action for injuries resulting in death generally survives the injured party, with the result that damages may be collected by his executor or administrator. Similarly, an additional cause of action for damages arises from the loss occasioned by death, although such a claim was not recognized at common law.

Tortious injuries to or destruction of property usually result in damages measured in relation to the value of the property at the time of the injury or loss, with interest. The measurement of damages in cases involving the invasion of intangible legal interests, such as false arrest and imprisonment, defamation, and malicious prosecution, is governed by specialized rules of law, which are usually directed primarily to the affording of adequate compensation to the injured party. In contract cases, the measure of damages is the loss sustained as a result of the breach, limited by the general rule that the loss must have been reasonably foreseeable, at the time the contract was made, by the party to be held liable.

Consult McCormick, Charles T., *Handbook on the Law of Damages* (St. Paul 1935).

RICHARD L. HIRSHBERG.

DAMANHUR, dā-mān-hōōr' (ancient HERMOPOLIS PARVA, hēr-mōp'ō-lis pār'vā), city, Egypt, capital of Beheira Province, in northern Lower Egypt, located west of the Rosetta branch of the Nile River and east of the Alexandria branch, about 37 miles east-southeast of Alexandria. Damanhūr is a canal and rail center today, with trade in rice and cotton. The chief industries are textile weaving and cotton ginning. The ancient Egyptian town of Timenhor which stood here was a center of worship of the god Horus. Pop. (1947) 84,983.

DAMAO, dà-moun', or **DAMAN**, dà-mān', district of Portuguese India, consisting of three small enclaves with an area of about 148 square miles, located in the northern part of the Konkan in western Bombay State, on the eastern coast of the Gulf of Cambay, about 100 miles north of Bombay. One of the enclaves is around the town of Damão, another surrounds the town of Dadra, while the third, Nagar Aveli, is at the foot of the Western Ghats. Rice, tobacco, and wheat are the principal agricultural products, and fishing, lumbering, weaving, and salt extraction are carried on. Administratively, the region is under the governor general of Goa. Most of the area was annexed by Portugal in 1559, although Nagar Aveli was granted to Portugal in 1780 by the Marathas. Pop. (1940) 63,521.

DAMAO or **DAMAN**, India, the chief town of the Damão district, a seaport on the Gulf of Cambay about 100 miles north of Bombay. Fishing, shipbuilding, and salt extraction are carried on. The port, at one time active and prosperous, is little used now. The town of Damão was destroyed by the Portuguese in 1531, retaken in 1558, and annexed to Portugal in 1559. Pop. (1940) 4,757.

DAMAR. See **DHAMAR**.

DAMARALAND, dà-mār'-ā-lānd; dām'-ā-rā- (also HERREROLAND, hē-rā'rō-lānd'), region, South-West Africa. It includes the highest plateau of the territory. Centered about Windhoek, the capital of South-West Africa, the region is bordered on the west by the Atlantic Ocean, on the north by Ovamboland, on the east by the Kalahari Desert, and on the south by Namaqualand. Damaraland is not so dry as most of South-West Africa and is the place of residence for most of the whites of the territory. The native inhabitants include both the Herero, who are of Bantu stock, and the Hill Damara, who are of Hottentot blood. Cattle raising is carried on.

DAMASCENE, John. See **JOHN OF DAMASCUS**, SAINT.

DAMASCENING or **DAMASKEENING**, the art of inlaying iron, steel, or bronze with other metals, especially gold and silver. This art is of great antiquity. Herodotus mentions a dish so ornamented, and the shields of some of the forces of the Samnites who fought against Rome were damascened. It was formerly much used in Damascus and is still found in modern

Near Eastern objects of art. The most beautiful specimens are produced by cutting into the contrasting background metal with a graver and other tools proper for engraving on steel, and afterward filling up the incisions with gold or silver wire. The watered pattern produced on the surface of certain forged objects, such as sword blades, gun barrels, or armor made from Damascus steel (q.v.), is also known as damascening. An inferior style of damascening can be produced electrolytically. The pattern is etched on the steel, and gold or silver is deposited in the etched lines.

DAMASCIUS, dā-māsh'ī-ūs, Greek philosopher, so named from his supposed native place, Damascus: b. about 480 A.D. He is known as one of the most distinguished teachers and the last head of the school of Neoplatonism (q.v.) at Athens. He studied in Alexandria, and then in Athens under Zenodotus and Marinus, the successors to the more famous Proclus. In 529 the school headed by Damascius was closed on the order of Justinian, and Damascius and several others, including Simplicius, one of his principal disciples, took refuge at the court of Khosrau I, king of Persia. But at the Persian court the philosophers did not find an atmosphere to their liking, and about 533 they returned to Athens, the Persian king having gained from Justinian assurance that they would not be molested.

Several fragments of Damascius' writing remain, including a part of a life of Isidore, one of his teachers, and *Doubts and Solutions Respecting the First Principles*. The latter work, which was edited by C. E. Ruelle in 1889, is concerned with the nature of God and of the human soul, and puts forth the belief that God is infinite and cannot be comprehended by man's intelligence.

DAMASCUS, dā-mās'kūs (ancient DIRMASHQ; Arabic DIMASHQ or AL-SHĀM), the capital of the Republic of Syria, located in southwestern Syria approximately 53 miles southeast of Beirut, Lebanon. The city nestles against the barren eastern slopes of the Anti-Lebanon (Anti Liban) Mountains where they level out to join the desert. Watered by the Barada River, to which the city owes its existence, Damascus is surrounded by a large and verdant irrigated area, the Ghūṭah, which produces a great variety of fruits, grains, and vegetables. The Barada seems present everywhere in Damascus, with its many subdivisions both irrigating the Ghūṭah and furnishing water for baths, mosques, drinking fountains, and homes in the city.

The city is divided into various quarters, including the peasant, the Christian, and the European and upperclass sections, and the bazaar. The population is Arab, about three quarters Moslem, and there are perhaps 50,000 Christian Arabs, among whom the Greek rites predominate. The third indigenous community is the Jewish. Newcomers, who have added to the picturesque blend of peoples, include Kurds, Algerians, Persians, Afghans, and Turkomans. In 1950, the population of Damascus was 335,060.

Among the most important historical sites are the Umayyad (or Great) Mosque, the fourth holiest in Islam, which was constructed in 705 on top of earlier Christian and pagan edifices; the citadel, originally Roman, but mostly dating from the 13th century; and the tomb of Saladin.

There is an attractive modern museum. In the Christian quarter there are various semilegendary sites associated with the conversion of St. Paul. The "street which is called Straight" (Acts 9:11) is one of the main thoroughfares in the bazaar. Educational institutions include the Arab Academy, the Syrian University, and numerous primary and secondary schools. There are some 250 mosques; the city's glorious past, and its role as a rendezvous for the pilgrimage to Mecca, have given Damascus a holy aura.

Industrial life is centered on handicrafts such as inlay work, jewelry, and weaving, especially brocades, and on newer industries such as cement, food processing, and furniture manufacture. Formerly famous industries such as fine Damascus steel (q.v.) and glass have been eliminated by Western competition; however, the bazaars preserve their traditional color. With the decline of caravan traffic, the commercial importance of Damascus has also declined.

History.—Of very ancient origin, Damascus first comes into full light as the capital of an Aramaean kingdom which fell before the Assyrians in 732 B.C. It was not especially important under the Seleucids, but after it was captured by the Romans in 64 B.C., it flourished under Roman rule. The city retained considerable importance under the Byzantines, but was forever lost by them to the invading Moslem Arabs in 636. Under the Umayyads (661–750), Damascus was the capital of the Moslem world and reached its greatest height. It was reduced to a provincial or minor dynastic capital after 750, but rose again to particular importance as a counter-Crusading center. Thereafter, despite Mongol invasions, Damascus remained the chief city of Syria. It was occupied by the Ottomans from 1516 until its liberation by Anglo-Arab forces in 1918. Damascus became the Syrian capital under French mandate and remained the capital of the republic after the achievement of complete independence in 1946.

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R. BAYLY WINDER,

Department of Oriental Languages and Literatures, Princeton University.

DAMASCUS STEEL, one of two metallic components in the famous sword blades made at Damascus, Syria, during the Middle Ages and probably much earlier. Neither the origin nor the method of making Damascus steel is definitely known. It is believed that the steel in some Damascus weapons was wootz steel, an ancient type of crucible steel, made in Hyderabad, India. It is also believed that the steel in other Damascus weapons was made by the crucible process or a combination of the cementation and crucible processes.

Damascus sword blades were probably made by hammering alternate layers of iron and steel into thin bars, cutting the bars into shorter lengths, bundling them together, reheating them and forging them together again into a thin bar, and repeating those operations until the iron and steel were thoroughly kneaded together. Each retained its identity, so that when the finished blade was slightly etched the composite structure resembled the watered pattern charac-

teristic of the Mohammedan damask fabrics. This "watered steel" has been called "the ladder on which the faithful ascended to heaven." The resulting Damascus blade was tough and held a sharp edge. Reputedly, it could bisect a feather floating in air, chop down a tree, or with one stroke cleave an armored enemy from head to foot.

DAMASK, dām'ask. All handwoven fabrics can be reduced to three fundamental types: cloth, twill, and satin. Of these, *cloth*, produced by simply crossing wefts and warps, over and under, is by far the oldest. With the introduction of multiple heddles came twill and satin. *Twill* is a fabric of diagonal ribs which are obtained by passing the weft thread over one and under several warps, generally from three to five, then over one and so repeated. On the return, and in all succeeding throws of the shuttle, the one covered warp is moved in echelon to right or left, thus producing diagonal lines. This is warp twill; for weft twill the operations are reversed, the weft passing under one and over several warps in echelon. *Satin* is an irregular warp twill in which the weft threads disappear completely beneath the warp threads. Thus a smooth, glossy surface is obtained which makes it the ideal weave for silk. Weft satin, also called sateen, is rarely used in silk weaving.

These three fundamental weaves have only one set each of warp and weft threads, yet even with these limited means weavers have found many ways to enhance their beauty. Especially successful is the elaboration of simple satin into fancy satin, with pattern areas of a contrasting weave. This was further improved when weavers began to give attention to the "wrong" side, the back of the fabric. By reversing the two types of weave, using the ground satin of the obverse for the pattern area of the reverse and the contrasting weave of the obverse pattern area for the ground area of the reverse, an entirely novel, very useful, and handsome fabric is obtained.

This fabric with the essential characteristic of being reversible is *damask*. The weave used for contrast with the satin is generally weft twill, more rarely cloth or sateen. Damask is at its best when woven of one color, yet there are times when damasks of two colors are preferred, one for the warp—the satin ground—and one for the weft—the contrasting weave. Sometimes damasks are enriched with a superimposed secondary design, by brocading, as with gold thread, or by printing. It must be said that such embellishments really destroy the original intention by interfering with the reversibility. Two fabrics sometimes mistakenly classified as damasks, brocatelle and lampas, are really compound satins, handsome but not reversible.

The History of Damask.—The early history of damask is still shrouded in darkness. Yet it is known that quite early in the history of silk weaving Chinese weavers experimented with the possibility of producing reversible fabrics. Fragments of silks, which might almost be called pseudodamasks, with the design partly visible on the reverse, have been found at both ends of the long road along which the silks of the Han period were brought to the Roman Empire, at the Chinese frontier station of Lou-Lan in eastern Turkestan and at Palmyra in Syria.

True damask was finally evolved as an after-

math of the invention of satin; the earliest preserved fragments were woven in Italy in the 14th century, and in China probably slightly before then. The name by which we still call this fabric connects it with the city of Damascus, Syria, perhaps because of its superficial similarity to the far-famed damascened sword blades with their engraved designs. In the Middle Ages, Damascus was already an old center of fine weaving (q.v.), but the rich fabrics mentioned by poets and chroniclers were probably elaborate gold brocades of many colors.

The heyday of damask in Europe lasted from the 15th century to the 17th century. Its popularity ebbed in the 18th century when taffeta and corded silks were preferred; these latter fabrics lent themselves more naturally to the then prevalent fashion of polychrome brocaded designs.

In the 16th century the flax-growing countries of northern Europe evolved the weaving of linen damask for tablecloths and napkins. In the 17th century such weaving of linen damask became a very profitable industry especially in Flanders, and soon also in northern Germany and Ireland. Today linen thread is still used for table damask of fine quality, but mercerized cotton and even synthetic yarns have made large and quite successful inroads into the domain of less expensive household naperies.

ADELE COULIN WEIBEL.

DAMASKINOS, thā-mā-skē-nōs' (original name DEMETRIOS PAPANDREOU), Greek churchman: b. Dobritza, Thessaly, Greece, 1891; d. Psychico, Greece, May 20, 1949. While primate of the Greek Orthodox Church, he served as regent of Greece from Dec. 31, 1944, to September 1946 and in October 1945 also acted for a short time as premier.

As a youth he attended school at Karditsa and later studied law and theology at the University of Athens. After serving as a private in the Greek Army during the Balkan War of 1912, he took his holy vows as a priest in 1917 and five years later was named bishop of Corinth.

Damaskinos' talent as a mediator was first exercised in 1918, when he settled nationalist quarrels among Greek, Serbian, and Bulgarian monks at the monastery on Mount Athos. His nomination, Nov. 5, 1938, as archbishop of Athens and all Greece was opposed by Premier John Metaxas, who forced the election of Bishop Chrysanthos of Trebizond and exiled Damaskinos to the monastery of Phaneromene on Salamis. He remained there until 1941, when he was recalled to replace Chrysanthos, who was exiled for refusing to swear in the pro-Axis George Tsolakoglou as premier under the Nazi occupation.

During the occupation of Greece, Archbishop Damaskinos openly opposed the Germans. Shortly before the British liberation in October 1944, he was placed under house arrest at Psychico for such activities as persuading orthodox Greeks to conceal Jews from the Germans, and organizing the National Organization of Christian Solidarity (EOCHA), which aided internees and supported the resistance movement. After the liberation, civil war precipitated a grave situation in Greece. Greek government forces, supported by British troops, finally succeeded in establishing civil order, and it was agreed to appoint a regent until a plebiscite on the return of the monarchy could be arranged. Archbishop

Damaskinos, though attacked by both conservative and radical groups, succeeded in holding the nation together during the period of its greatest distress until the return of King George II on Sept. 27, 1946.

DAMASUS I, dām'ā-sūs, Saint and pope: b. Rome, c.304; d. Dec. 11, 384; r. 366-384. Of Hispanic origin, he was born in Rome, where he first served at the church of St. Laurence. As deacon he espoused the cause of Pope Liberius, whom Emperor Constantius II banished (355), but when the emperor appointed Felix as anti-pope, Damasus submitted until the latter was expelled and Liberius was reinstated (357).

Damasus' election as pope was contested by a faction, which, amid violence and bloodshed, chose the deacon, Ursinus, and had him consecrated irregularly. The emperor, Valentinian I, recognized Damasus and exiled Ursinus. A synod of 44 bishops, convened to sift the charges, exonerated Damasus, and excommunicated Ursinus.

Damasus vigorously defended the faith at a time of great crisis: he condemned Arianism, the Apollinarians, and the Macedonians (qq.v.); he excommunicated Auxentius, the Arian bishop of Milan; he refused the plea of the heretic, Priscillian; and he supported the Christian senators in their effort to have the pagan altar of Victory removed from the Roman Senate. Damasus induced St. Jerome, who was his private secretary for a time, to translate the Bible into Latin. One of his most notable works was the restoration of the catacombs and the placing of epitaphs and inscriptions on the tombs of the martyrs. His feast is December 11. See also VULGATE, THE

DAMASUS II (POPPO), pope: b. Bavaria, Germany; d. Palestrina, Italy, Aug. 9, 1048. When Pope Clement II died, Benedict IX tried to seize the throne but was expelled, and the emperor, Henry III, appointed the Bavarian bishop, Poppo of Brixen, to the papal chair. Damasus II died 23 days after becoming pope, a victim of malaria.

DAMBUL, dām-bōōl', **DAMBOOL**, or **DAMBULLA**, village, Ceylon, located at an important road junction about 40 miles north of Kandy. The village takes its name from a large rock which rises high above the surrounding plain and which contains a number of caves, one of them with a huge, recumbent statue of Buddha from the 1st century A.C. Rice and vegetables are grown in the village. Pop. (1941: including nearby villages) 1,253.

DAME (Lat. *domina*, mistress), a title of honor which long distinguished highborn ladies from the wives of citizens and of the commonalty in general, and which still is the legal title in Great Britain of a baronet's or a knight's wife. It is also given to female members, holding a rank equivalent to that of knight in the Order of the British Empire. In consequence of the greater courtesy shown toward women of higher rank, it became customary to prefix the word *ma* to *dame*, as a special proof of veneration and homage. Hence, too, the Virgin Mary was called in France *Notre Dame* (our lady, as if no single Christian could exclusively claim the privilege of serving her with the homage of his heart). The daughters of the

king of France, as soon as they came into the world, were called *madame*; and this was also the sole title of the wife of the king's eldest brother. In England, the word *dame*, though not much used, is applied to married women of all classes. It was also applied in the 19th century to the mistress of a small elementary school or of a boardinghouse at boys' schools. *Madame* is shortened into *madam*, a usual term of address for ladies in general, but remains also a term of honor, applicable, in particular cases, to royal personages.

DAME AUX CAMELIAS, *La, là dām ō ka-mā-lyā'* (THE LADY OF THE CAMELLIAS). This play by Alexandre Dumas *fils* first appeared (1848) as a novel written under the stress of debts incurred in accumulating experiences that the work in part reflects. The novel was dramatized in 1849, but, owing to the failure of a theater and curious complications with the censorship, it was not acted until Feb. 2, 1852. Success was immediate and lasting. In manifold adaptations it has been played in many lands and has engaged the talent of many noted actresses. In the United States, the play, which has gone into many editions, has been known as *Camille* and as *The Lady of the Camellias*. The story had its immediate origin in the life and death of a Parisian courtesan, who died of consumption in 1847 at the age of 23. The heroine of the play, Marguerite Gautier, is so drawn by a requited love to Armand Duval that she makes all material sacrifices to live wholly with and for him. His father shows her what this will involve for Armand's career. Then, rising to the height of immolation, she deliberately estranges her lover, who learns too late the price of her devotion. The theme of the courtesan redeemed by love is at least as old as Abbé Prévost's *Manon Lescaut* (1731). Giuseppe Verdi used the same story in *La Traviata* (1853). The Dumas' play marks the beginning of the realistic portrayal of social problems on the French stage which has since so largely engaged its attention.

DAME'S VIOLET, a common name for a coarse, tall biennial or perennial, flowering in the late spring or early summer. It is also called *dame's rocket*, *gillyflower*, *damask violet*, *dame-wort*, and *sweet rocket*. The plant has been naturalized in the United States from Europe and belongs to the mustard family (Cruciferae). Its classical scientific name *Hesperis matronalis*, or *Mother-of-the-Evening*, refers to the fact that its large lilac to purple flowers in panicle racemes become fragrant in the evening. Several varieties are in cultivation, those with regular flowers being increased by seed, the double flowered forms by cuttings or division.

DAMGHAN, *dām-gan'*, town, Iran, located about 165 miles northeast of Teheran at the foot of the Elburz Mountains at an altitude of 3,767 feet. The town, which was of greater importance during the Middle Ages, is on the principal highway from Teheran to Meshed. It is chiefly a trading center today; almonds, pistachio nuts, grain, and cotton are the chief products of the surrounding area. The ruins of ancient Hecatompylus, the capital of Parthia, stand close by. Pop. (1941) 12,235.

DAMIANA, *dām-ī-ān'ā*, the name of a small

yellow-flowered shrub, *Turnera diffusa*, found from Texas to Lower California, and in South America and the West Indies. The name is also given to the drug obtained from the dried twigs and leaves of this species. The plant has an aromatic odor and pleasant taste, and contains a volatile oil (0.5-1 per cent) with a warm, bitter, camphorlike taste, two resins, a bitter principle (*damianin*), tannin, sugar, and albuminoids. Its use for impotence has been ineffective. It has also been applied in the treatment of dysentery, malaria, and other diseases. The name *damiana* is sometimes given to members of the genus *Aplopappus* and related genera of the Compositae.

DAMIANI, *da-myā'nē*, **SAN PIETRO** (Eng. SAINT PETER DAMIAN, *dā'mi-ān*), bishop, cardinal, and doctor of the Roman Catholic Church: b. Ravenna, Italy, 1007; d. Faenza, Italy, Feb. 22, 1072. After a difficult childhood, during which he worked as a swineherd for one of his brothers, he was sent to school by another brother, Damiani, a priest, whose name he took in gratitude. He studied at Faenza and Parma, where he also taught, but later he renounced an academic career for the monastic life, and after joining the hermits of the Holy Cross of Fonte Avellana became head of their monastery (1043).

Named bishop and cardinal of Ostia by Pope Stephen X in 1057, he thereafter took a leading part in the affairs of the church. With Hildebrand, the future St. Gregory VII, he helped to elect Pope Nicholas II, whose pontifical policies reflected Damiani's ideas. With Bishop Anselm of Lucca, who was to become Pope Alexander II, he was sent in 1059 to Milan to settle abuses and quarrels that troubled the city, and in 1063 he went to France to compose a jurisdictional dispute between the bishop of Mâcon and the abbot of Cluny. He headed a mission to Florence in 1067 and presided in 1069 at a council in Frankfurt, where he dissuaded Emperor Henry IV from divorcing his queen, Bertha of Savoy. In 1072 he was called from Fonte Avellana to reconcile the city of Ravenna to the Holy See and died while returning to the monastery. His body rests in the cathedral of Faenza.

Fearless and tireless in combating heresy, schism, and moral abuse, Pietro Damiani was one of the outstanding personalities of the 11th century. He was recognized during his life as a man of great zeal and austerity and was quickly acclaimed a saint after his death. February 23 is observed as his feast day. In 1828 Pope Leo XII named him a doctor of the church.

San Pietro Damiani's writings, on a wide range of subjects, are valuable both for their doctrine and as sources for 11th century history. They include 150 letters; 75 sermons; many prayers and hymns; lives of the saints, works on the ascetic life, such as *De perfectione monachorum*, *De ordine eremitarum*, *De perfecta monachi informatione*, *De suae congregationis institutione*, and *De vita eremitica*; works on theology, such as *De fide catholica*, *Contra Graecorum errores de processione Spiritus Sancti*, *De bono suffragiorum*, and *De sacramentis per improbos administratis*; works on moral and disciplinary subjects, such as *De castitate*, *Liber Gomorrhianus*, and *Contra clericos regulares proprietarios*; and works on church government, such as *Liber gratissimus*, *Disceptio synodalis*, and *Actus Mediolani de privilegio Romanae ecclesiae*.

Consult Migne, J. P., ed., *Patrologia Latina*, vols. 144-145 (Paris 1867); Capeceaturo, Alfonso, *Storia di San Pier Damiano* (Rome, 1887); Fliche, Augustin, *La réforme grégorienne*, vols. 1-2, esp. pp. 175-264 (Louvain 1924); Illm, O. I., *St. Peter Damian. His Teaching on the Spiritual Life* (Washington 1947).

JOHN K. RYAN.

DAMIANISTS or **ANGELITES**, disciples of Damian, the Monophysite patriarch of Alexandria, in the 6th century. They professed a belief in a unity of the divine nature different from that of the three separate Persons. They were also called Tetradites, or believers in a Quaternity. The Council of Chalcedon in 451 had condemned as heresy Monophysitic beliefs similar to those held by the Damianists in the 6th century.

The name Damianistes is sometimes given to the Sisters of St. Clare, a Franciscan order of nuns, which had its first convent at San Damiano, Assisi.

DAMIEN DE VEUSTER, dà-myān dē vūs-tār'; Eng. dā-mi-ēn, **Joseph** (known as **FATHER DAMIEN**), Belgian Roman Catholic missionary: b. Tremeloo, Belgium, Jan. 3, 1840; d. Molokai Island, Hawaii, April 15, 1889. He joined the Order of the Sacred Hearts of Jesus and Mary in 1863 and soon after was sent by his superiors as a missionary to the Hawaiian Islands. In 1873, at his own request, he was made chaplain to the leper colony on Molokai Island, and set about improving the housing conditions of the settlement, the food supply, and the water. He founded schools, built a church, and instituted religious worship among the unfortunate sufferers. About five years before his death he noticed the incipient stages of the disease in his own body, and from that time until his death he identified himself fully with the other colonists. His remains were returned to Belgium in 1936. An attack on the conduct and character of Father Damien brought forth a stinging reply from Robert Louis Stevenson in *Father Damien: An Open Letter to the Rev. Dr. Hyde* (1890).

Consult Farrow, John, *Damien the Leper* (London 1937).

DAMIENS, dà-myān', **Robert François**, French fanatic: b. Tieuilloy, Artois, France, 1715; d. Paris, March 28, 1757. He enlisted as a soldier, and was afterward a servant in the college of the Jesuits at Paris. At the beginning of 1757 he went to Versailles and prepared for the crime which he attempted on Jan. 5, 1757. As King Louis XV was on the point of getting into his carriage, Damiens stabbed him in the right side. The wound was of a trifling nature. Damiens did not attempt to escape. When questioned, he said that he had never intended to kill the king, as he might easily have done, but desired only to inflict a slight wound, to remind the king of his duties. Damiens bore the cruellest tortures with resolution, and could not be induced to confess that he had any accomplices. Fear that this action was merely a part of a larger plot, however, brought the ruling classes of the kingdom to a state of near panic for several weeks. Damiens was condemned to be tortured and then torn in quarters by horses.

DAMIETTA, dām-i-ēt'ā; dām-yēt'ā (Arab. Dīmīyāt, dōm-yāt'), town, Egypt, located approximately 100 miles north-northeast of Cairo

on the right bank of the eastern or Damietta (ancient Phatnitic) branch of the Nile River between Lake Manzala and the river and about 8 miles from the sea. The town is irregularly built but contains some fine mosques, bazaars, and marble baths. Damietta was at one time a busy and prosperous commercial center, but it has been eclipsed by Alexandria and Port Said. The weaving of cotton and silk fabrics, leather tanning, and shoe manufacturing are the principal industries. Rice, fish, and fruit are exported. A bar at the mouth of the Nile prevents large vessels from reaching the town and compels them to anchor outside and load and unload by means of small craft.

The ancient town of Damietta, called Tamiathis, stood about five miles to the north, nearer the sea, and figured importantly in the Crusades. In 1219, Count William of Holland came with a fleet manned chiefly by men of Haarlem, built a platform high up on the masts of his ships so that he could let down a scuttle, and thus captured the outlying tower, broke the great chain between the tower and the mainland, and took the city. In commemoration of this event, the city of Haarlem bears on its shield a cross and a sword between four stars, with the motto *Virtus V'm Victus* (Courage conquers force), and a carillon of bells nightly sounds out the *Damietje*. In 1249 during the Sixth Crusade forces led by King Louis IX of France captured the town. The continuing danger to which the town was exposed due to its position close to the sea induced the Egyptian caliphs to change its position, and about 1251 the old town was razed and the settlement moved to the site where the modern town now stands. The present town contains many antique columns and blocks supposedly brought from the old site. Pop. (1947) 53,620.

DAMIRI, al-, āl-dā-mē'rē (Arab. KAMĀL AL-DĪN MUḤAMMAD IBN-MŪSA AL-DAMIRI), Arab jurist and author: b. Cairo, Egypt, 1344?, d. there, 1405. A member of the Shafi'ite school of law, he wrote on canon law and natural history. His most famous work was the *Life of Animals* (*Hayāt al-Hayawān*), an alphabetical dictionary dealing with the animals mentioned in the Koran and discussing their use in food and medicine and their place in Arab folklore. An English translation in two volumes was made by A. S. G. Jayakar (1906-1908).

DAMJANICH, dōm'yō-nich, **János**, Hungarian soldier and patriot: b. Staza, Banat region, Hungary, 1804; d. Arad, Hungary (now Rumania), Nov. 6, 1849. Of Serbian origin, he embraced the liberal cause at the beginning of the Hungarian war of independence and became a major at Szeged. In 1849 he was named general and placed in charge of the 3d Army Corps. During the spring of 1849, Damjanich played an important role in several battles. Following the Hungarian defeat at Világos, he surrendered himself and his forces to the Russians, and the Russians gave him over to the Austrians, who executed him.

DAMMAR, dām'ēr, a resin or group of resins obtained from various evergreen trees of southeastern Asia, Australia, and New Zealand. Dammars, along with copal resins, constitute a large group of resins of recent, semifossil, or

fossil origin found in tropical countries. They belong to the hard resins, which contain almost no essential oils but are readily soluble in alcohol. They are usually solid, straw-colored, more or less transparent, brittle substances lacking distinctive taste or odor. Dammars, which are freely soluble in turpentine, are less hard and durable than copals, and are best suited for manufacture of varnishes used for paper and decorative work. Industrial usage is restricted to those natural resins obtained principally from southeastern Asiatic members of three families of flowering plants, namely the Dipterocarpaceae (genera *Balanocarpus*, *Hopsea*, and *Shorea*), Burseraceae, and Guttiferaceae. The best-known commercial variety is the so-called Batavian dammar, derived from *Shorea wiesneri* of Java and Sumatra.

The name dammar is often incorrectly applied to kauri and Manila copal. Manila or East Indian copal comes from a broad-leaved conifer (*Agathis alba*), found in the East Indies, Malaya, and the Philippines. Kauri resin comes from the kauri (*A. australis*), one of the most valuable but rapidly disappearing timber trees of the world, found in New Zealand; and from the Australian kauri (*A. robusta*) and other species of this genus. For a century, kauri resin, one of the most valuable natural hard resins found in a fossil state, was a major article of export from New Zealand; however, natural supplies are vanishing, and trade is declining. See also KAURI.

DAMMARA, a genus of broad-leaved Pacific coniferous trees now known as *Agathis*. See also DAMMAR; KAURI.

DAMNATION DE FAUST, La (THE DAMNATION OF FAUST), a dramatic cantata in four parts by Hector Berlioz. It is based upon Gérard de Nerval's translation of Johann Wolfgang von Goethe's *Faust*, which Berlioz rewrote in collaboration with Almiré Gandonnière. *La Damnation de Faust* was first produced in concert form at the Paris Opéra-Comique on Dec. 6, 1846, and first staged as a drama at Monte Carlo in 1890. The first production in the United States in concert form took place in 1880, and in the stage version in 1906.

DAMOCLES, dām'ô-klēz, a native of Syracuse who flourished in the first half of the 4th century B.C., one of the courtiers and flatterers of the tyrant Dionysius the Elder. His name has become proverbial in consequence of a well-known anecdote related by Cicero and Horace about him, illustrating the uncertainty of human greatness and felicity. As Damocles was extolling the grandeur and happiness of Dionysius, the ruler invited him to a magnificent banquet, where he would be entertained with regal fare and honors. In the midst of the entertainment, however, when Damocles looked upward, he perceived a naked sword suspended over his head by a single hair. The sight made him realize at what a sacrifice of mental peace and personal security the enjoyments and splendors of royalty are purchased.

DAMON AND PHINTIAS, dām'mūn; fīn'tī-ās (incorrectly called PYTHIAS, pīth'i-ās), two illustrious Syracusans of the 4th century B.C., celebrated as models of constant friendship.

Phintias had been unjustly condemned to death by Dionysius the Elder, tyrant of Syracuse, but he obtained permission to arrange his affairs in a neighboring place on condition that his friend should remain as a pledge of his return. Damon surrendered himself at the prison, ready to suffer death instead of Phintias if the latter did not return at a fixed time. Unexpected impediments detained Phintias. Damon, still fully convinced of the faithfulness of his friend, was on the way to the place of execution, and the people began to murmur and to pity his credulity, when Phintias suddenly rushed through the crowd into the arms of his friend. While each demanded to die for the other, Dionysius himself approached, pardoned them, and entreated them to admit him to their friendship. Schiller described this adventure in a ballad, *Die Burgschaft*.

DAMOPHON, dām'ô-fōn, Greek sculptor: b. Messene, Greece, fl. 2d century B.C. He made statues for several towns in the Peloponnesus, including Aigion, Lycosura, Megalopolis, and Messene. Heads of his statues of Demeter, Artemis, and Anytus have been found. After the ivory head of the *Zeus* of Phidias cracked, Damophon restored that work. Damophon's work combined the expressive monumentality of the Phidian age with the more elaborate decorativeness of the Hellenistic period.

DAMPER, a plate in an air draft or flue, for the purpose of controlling an enclosed fire by regulating the ingress or egress of air. Dampers are of various forms. They stand in the same relation to the air pipe or flue as a valve or faucet does to a duct for steam or liquids. The dampers of furnaces are either in the door of the ashpit, to regulate the ingress of air, or in the shaft or on top of the chimney, to close the outlet for the volatile results of combustion. In the latter form they are used in almost all metallurgic furnaces.

In locomotive engines, the damper is a kind of iron Venetian blind, fixed to the smokebox end of the boiler in front of the tubes. It is shut down when the engine is standing still, and thus stops the draft and economizes on fuel. The damper is opened when the engine is running.

In the piano, the damper consists of small felt-covered pieces of wood, which are arranged to press upon the wires of the piano and check their vibration whenever the finger leaves the keyboard. When the damper pedal is depressed, the dampers leave the wires and thus prolong the vibration; when the pedal is released, the dampers are again placed in contact with the wires and check the vibration.

DAMPIER, dām'pī-ēr; dāmp'yēr, William, English buccaneer and explorer: b. East Coker, Somersetshire, England, probably in June 1652; d. London, March 1715. Navigator, explorer, and frequent participant in freebooting activities, Dampier discovered and named New Britain Island and was probably the first Englishman to see Australia. His accurate hydrographic and meteorological observations provided much valuable information for later explorers.

After an adventurous early life spent as a sailor, Jamaica planter, logwood cutter, and buccaneer, he joined a group in Virginia in 1683 and embarked on a voyage of plundering and

marauding which took him first to the coast of Africa and then around Cape Horn to the west coast of South America. In 1685, Dampier left the main group to join a certain Captain Swan, who sailed first to the coast of Mexico and then across the Pacific. The freebooters eventually reached Guam and later the Philippines, where Swan was abandoned. Dampier himself was marooned on Nicobar Island in 1688, and it was three years before he returned to England. An account of his long travels published in 1697 as the *New Voyage Round the World* was highly successful and was followed in 1699 by a supplementary volume entitled *Voyages and Descriptions*, which included the important and accurate "Discourse of Winds."

Sent by the English Admiralty in 1699 on a voyage of exploration to the southwestern Pacific area, Dampier sighted the coast of Australia on July 26, 1699. He then explored the coasts of Timor and New Guinea and discovered New Britain Island. On the return voyage his ship, the *Roebuck*, was wrecked on Ascension Island where Dampier and his men lived on wild goats and turtles for several weeks until they were rescued. Dampier was evidently a better pilot than ship commander, for there was much unrest among the crew members on this trip, and in 1702, he was found guilty in court martial of having been inordinately cruel to a young officer. Dampier described this trip in *A Voyage to New Holland in the Year 1699*, which was published in two parts in 1703 and 1709.

Unrest among the crew was also in evidence during Dampier's third voyage around the world from 1703 to 1707. On this trip, on which he commanded two vessels, Dampier marooned Alexander Selkirk, the prototype of Robinson Crusoe, in the Juan Fernández islands, 400 miles off the coast of Chile. An account of the early part of this unsuccessful expedition, written by a certain Funnell, brought a violent reply from Dampier in *Captain Dampier's Vindication of His Voyage* (1707).

In 1708, Dampier joined another privateer as a pilot. The company rescued Selkirk (1709), captured a Manila treasure ship, and, after a long voyage across the Pacific and Indian oceans and around the Cape of Good Hope, returned to England in 1711 with a booty valued at nearly £200,000. Unfortunately for Dampier, however, the prize money was not distributed until after his death.

Consult *Dampier's Voyages*, 2 vols., ed. by John Masefield (London 1906); Wilkinson, Clennell, *Dampier, Explorer and Buccaneer* (New York 1929); Bonner, William H., *Captain William Dampier, Buccaneer-Author* (Stanford, Calif., 1934).

DAMPIER ARCHIPELAGO, dăm'pēr, island group, Australia, a cluster of small, rocky islands in the Indian Ocean just off the northwestern coast of Western Australia. Enderby Island, about 21 square miles in area, is the largest of the group, which also includes Dolphin, Legendre, Rosemary, Lewis, and Delandre islands. The archipelago was named for its discoverer, William Dampier.

DAMPIER LAND, peninsula, Australia, located on the northern coast of Western Australia on the Timor Sea. It is bounded by the open sea on the west and by King Sound, into which flows the Fitzroy River, on the east. Cape Leveque forms the northward projecting

tip of Dampier Land. The peninsula was named for the English explorer, William Dampier.

DAMPIER STRAIT, (1) passage, Bismarck Archipelago, in the southwest Pacific, separating the western end of New Britain Island from Umboi Island. The strait is about 15 miles in width.

(2) Channel, Malay Archipelago, separating the island of Waigeo from the northwestern coast of New Guinea Island. It is about 90 miles long and from 20 to 50 miles wide.

DAMPING-OFF, the rotting of seedlings or cuttings in a seedbed or cutting bench, usually just above the surface of the soil. The immediate cause is a soil fungus (usually *Artotragus* or *Pythium debaryanum*, though other fungi may produce the same effect) which feeds upon decaying organic matter until it obtains a favorable opportunity for attacking a living host. This opportunity generally comes when the seedlings or cuttings are weakened by a stagnated atmosphere highly charged with moisture and of rather high temperature. The fungus gains entrance to the weakened stems which soon turn brown or black. The foliage quickly becomes infested and sometimes in a single night a whole seedbed or bench full of cuttings may become a rotting mass with no healthy plants left.

A second form of damping-off is characterized by the failure of the seed to sprout; in a third form, pre-emergence damping-off, the seedling is attacked by the fungus before it has pushed its way to the surface of the soil.

With careful management damping-off can be avoided. The propagating medium should be clean, sharp sand, which should be thoroughly drenched when the bed is watered; the excess water passes quickly away in perfect drainage. The bed should never be allowed to become dry. In short, both seedlings and cuttings should be kept growing steadily and sturdily. The drenching washes the spores of the fungus down through the sand. If a bed becomes infested, the healthy plants should at once be transferred singly and with as little soil as possible to fresh quarters. Neither freezing nor drying the soil will kill the fungus, which can live for months even when growth is impossible. Sterilizing the sand or soil with steam is sometimes resorted to, the sand being heated for several hours.

DAMPS, certain deleterious gases which are released in mines. See AFTERDAMP; CHOKEDAMP; COAL; FIRE-DAMP; GASES IN MINES AND COAL; MINE GAS.

DAMROSCH, dăm'rōsh, Frank Heino, American musician: b. Breslau, Prussia, June 22, 1859; d. New York, N. Y., Oct. 22, 1937. The son of Leopold Damrosch, young Frank Damrosch spent his childhood in a household filled with music and famous musicians. In 1871 the family moved to the United States where Frank continued his musical studies under his father. Upon graduation from the College of the City of New York, he entered commercial life and moved to Denver, Colo., to become a clerk in a hat store. But his musical talent was soon recognized, and after working as a church organist and conductor of the Denver Chorus Club (1882-1885), he became supervisor of music for the public schools of Denver (1884-1885). Later

he returned to New York, where he was chorus master of the Metropolitan Opera House from 1885 to 1891 and, in 1892, organized the People's Choral Union to popularize choral singing. From 1897 to 1905 he was supervisor of music in the public schools of New York City. He also served as musical director for many organizations, including the Musical Art Society (1893-1920); the Oratorio Society (1898-1912); the Symphony Concerts for Young People (1898-1912); the Orpheus Club and the Eurydice Chorus of Philadelphia (1897-1905); and the Mendelssohn Glee Club (1904-1909). In 1904 he founded the Institute of Musical Art, which became affiliated with the Juilliard School of Music in 1926, and served as dean until his retirement in 1933. In all this work Damrosch did much to increase popular appreciation of and general participation in good music. Among his publications was *Some Essentials in the Teaching of Music* (New York 1916).

DAMROSCH, Leopold, German musician: b. Posen, Prussia, Oct. 22, 1832; d. New York, N. Y., Feb. 15, 1885. He received a medical degree from the University of Berlin in 1854 and began the practice of medicine, but his love for music soon led him to give up this career for one in music. His appearances in various cities as solo violinist and conductor met with great success, and in 1855, through Franz Liszt, he was appointed solo violinist of the court orchestra at Weimar. From 1858 to 1860 he served as conductor of the Breslau Philharmonic Orchestra, and in 1862 he established the Breslau Orchestral Society, remaining the director until 1871. In 1860 he made concert tours with Carl Tausig and Hans von Bülow.

Invited to the United States in 1871 to become the conductor of the Männergesangverein Arion, a male chorus, Damrosch soon became a leader in the musical life of New York. In 1873 he established the New York Oratorio Society, a mixed choral group, and in 1878 he founded the Symphony Society of New York. The first large-scale music festival in the United States was given under his direction in New York in 1881, with an orchestra of 250 members and a chorus of 1,200 singers. In 1884-1885, Damrosch conducted a series of German operas at the Metropolitan Opera House, including the first American performances of several Wagnerian operas. He also gave the first performance in the United States of Johannes Brahms' Symphony No. 1.

Damrosch, whose important contribution to American musical life was continued by his sons, Frank and Walter, was especially significant for his influence in raising the standards of music appreciation and performance in the late 19th century and in introducing into the United States new German works. An excellent organizer with keen artistic perception, he zealously maintained a high artistic ideal. Among his many compositions are cantatas, marches, solo violin compositions, songs, three violin concertos, and a symphony.

DAMROSCH, Walter Johannes, American musician: b. Breslau, Prussia, Jan. 30, 1862; d. New York, N. Y., Dec. 22, 1950. Devoted to music from early childhood, Walter Damrosch studied under his father, Leopold Damrosch, and under Wilhelm Rischbieter, Felix Draeseke, Hans von Bülow, and others. Having come to

the United States as a boy of nine, he became conductor of the Newark (N. J.) Harmonic Society when he was nineteen, and three years later was appointed assistant to his father, who was then conducting German opera at the Metropolitan Opera House. After his father's death in 1885, Walter continued at the Metropolitan as assistant director and second conductor under Anton Seidl. In that year, he also succeeded his father as director of the New York Symphony and Oratorio societies.

Walter Damrosch organized the Damrosch Opera Company in 1894, and for the next five years he toured the United States presenting German opera. From 1900 to 1902 he again served the Metropolitan as conductor of German opera, and in 1902-1903 he was conductor of the New York Philharmonic Society. He reorganized the New York Symphony Society in 1903 and served as its director until 1927 when it was merged with the New York Philharmonic. He then became music counselor for the National Broadcasting Company (NBC), serving in that position until 1947. At NBC he inaugurated the *Music Appreciation Hour*, which from 1928 to 1942 instructed an estimated 5 million school children each week in music appreciation. During World War I, Damrosch organized an American Expeditionary Force bandmasters' training school at Chaumont, France. He conducted the first American performances of many famous works, including Johannes Brahms' Symphony No. 4, Peter Ilich Tchaikovsky's Symphony No. 4 and No. 6, and Richard Wagner's *Parsifal*.

The compositions of Damrosch include: Choral music—*Manila Te Deum* (1898); *An Abraham Lincoln Song* (1936); *Dunkirk* (1943). Operas—*The Scarlet Letter* (1896); *The Dove of Peace* (1912); *Cyrano de Bergerac* (1913; revised 1939); *The Man Without a Country* (1937); *The Opera Cloak* (1942); *Elephants in Congress* (1944). Orchestral music—Incidental music to Euripides' *Iphigenia in Aulis* and *Medea* (1915) and to Sophocles' *Electra* (1917). Songs—*Danny Deever*, *Death and General Putnam*, *Mandalay*, *To Sleep*, and *Was Ever Maid of Spain?* His autobiography, *My Musical Life*, was published in 1923 (revised 1930).

DAMS. To dam (originally, to stop up) is to obstruct or restrain the flow of a liquid. In engineering, a dam is a barrier to constrain or keep back a body of water. Dams vary widely in structure as well as in the materials used, the physical character of their sites, and the purposes for which they are constructed. Every dam is, in a sense, a special adaptation.

Dams are generally classified according to constituent materials, type of construction, and purpose. They are usually constructed of concrete, earth-fill materials, rock-fill materials, or a combination of earth- and rock-fill materials. Composite dams having a concrete section in addition to sections of earth or rock fill are also built. A few of the common types of construction for concrete dams are the gravity, arch, and buttress types; for earth-fill dams, the rolled-fill and hydraulic-fill types.

As to their purpose, dams are classified as storage or diversion dams. Storage dams may be further classed according to the specific storage purpose which they serve. This may be irrigation, flood control, power production, naviga-

tion, water supply, river regulation, sediment control, or debris control. Storage dams which serve more than one of these purposes are classed as multiple-purpose dams. Those dams which serve the primary purpose of diverting water from a river are termed diversion dams.

Dams for the storage of water for irrigation and for flood control have been used since the early ages of civilization. Outstanding are the ancient storage works of Ceylon and India. One of the reservoirs in Ceylon, the Tank (reservoir) of Padavil, was formed by a dike 11 miles long, about 200 feet wide at the base, 30 feet wide at the top, and about 70 feet high, which was faced by layers of squared stone. This dam had a volume of about 17 million cubic yards of earth. An ancient Indian reservoir, the Ponriary Tank, contained an area of about 80 square miles and its waters were impounded by a dam about 30 miles long.

The civilizations of the Nile Valley, the Euphrates-Tigris Plain, and areas of Syria, Persia, Java, and India flourished with the growth of dams and other irrigation facilities. The water impounded by a dam built by a pharaoh in the 19th century B.C. regulated the floods of the Lower Nile River in Biblical times. Ever since, irrigation dams and main canals in Egypt have been constructed and maintained by the national government. In India, the ancient Hindu anicut, or irrigation dam, was invaluable in the development of irrigated lands.

The protection of lands against flood by the use of embankments, levees, or dikes was started in early times. The Chinese built levees along the Yellow River in double line, with cross-banks so that the failure of the front line at any point by undercutting or other cause would only inundate a check immediately behind. Likewise, the shores of the Po and Adige rivers of northern Italy were embanked in ancient times to control the floods of these rivers.

The construction of irrigation facilities in North America dates back approximately eight centuries to the works of the Pueblo Indians in what is now the southwestern United States. Archeological explorations carried out in New Mexico in 1910 uncovered evidence that the early inhabitants of the Chama River basin had constructed fairly extensive systems of small dams and canals to divert water from the streams and distribute it to the fields in which they grew the crops that formed an important part of their subsistence.

Of more pertinence in tracing the early history of dams and irrigation structures in America is the agricultural practice developed by the Spanish colonists as early as 1600 A.D. Irrigation was introduced in this arid land by the Spanish missionaries who established missions throughout the area now comprising western Texas, New Mexico, Arizona, and southern California.

Modern irrigation in the United States dates from July 24, 1847, when Mormon pioneers broke some desert land in the Salt Lake Valley of Utah and the next day diverted the waters of what is now City Creek, irrigated the plowed land, and planted potatoes.

In the 15 years following the Utah settlement, the pioneers who began carving a civilization out of the western deserts, the national census of 1860 shows, had established 752 irrigation enterprises that were supplying water to more than 400,000 acres of land. By 1900, there were some

20,000 different irrigation enterprises operating in the West.

With the passage of the Reclamation Act in 1902, the active entry of the government of the United States into the field of reclamation began, and with it a period of engineering development of western water and land resources which required the design and construction of dams, canals, and other irrigation structures. Outstanding examples of large storage dams constructed during the first decade of the Reclamation Service's operation are the Roosevelt Dam in Arizona and the Pathfinder Dam in Wyoming, both of cyclopean masonry (concrete with embedded large stones), and the Shoshone (now Buffalo Bill) Dam, also in Wyoming, which was the highest dam in the world when completed in 1910 and retained that distinction for several years.

The beginning of the Boulder Canyon Project in 1930, with Hoover Dam as its principal feature, marked a significant advance in engineering for dams. The whole project was distinguished by extraordinary planning and achievement. The various phases of investigation, planning, and design of this multiple-purpose project transcended all previous efforts. The massive size and great height of Hoover Dam exceeded all past conceptions of dam design. Large-scale generation of hydroelectric power for general industrial and public use at places far removed from the project area was included as a major feature of the project plan. Various other phases of stream regulation distinguished the multiple-purpose conception from anything that had been done before.

The Boulder Canyon Project was followed by other similar multiple-purpose projects, such as the Columbia River Basin Project in Washington, which includes the largest concrete dam in the world, Grand Coulee Dam; the Central Valley Project in California, which includes some of the largest dams in the United States; and the huge Missouri River Basin Project in which 14 large storage dams were completed by 1954, four more were under construction, and many more were planned, to control floods, develop irrigated lands, and provide other benefits intrinsic to multiple-purpose projects.

Masonry Dams.—The term masonry refers primarily to concrete dams, although it also includes dams of rubble or ashlar (hewed or squared) stone laid in mortar. Masonry dams are of four general types: (1) gravity, (2) arch, (3) arch-gravity, and (4) buttress.

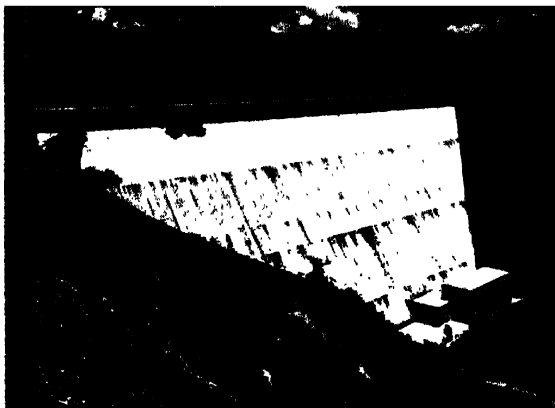
Gravity Dam.—The gravity dam, most common of all masonry dams, utilizes the weight of the masonry composing it to resist the forces exerted upon the structure. It is well adapted for use as an overflow crest for spillways, and because of this advantage, is often used for the spillway feature of other than masonry dams and as a low overflow dam constructed on gravel or sandy foundations. It is imperative that high masonry dams be built on rock foundations.

Gravity dams are approximately triangular in cross section. They are often constructed straight in plan but sometimes deviate from a straight line axis in order to take full advantage of the topography of the site. Some gravity dams have been constructed along a series of broken axis lines, others have axes which are slightly curved, and some are straight for a portion of their length and curved for the remaining portion.

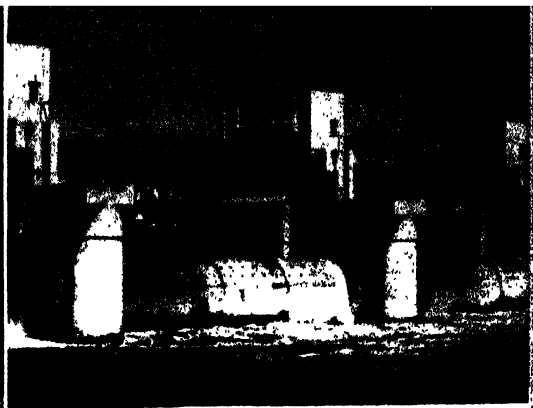


Bureau of Reclamation

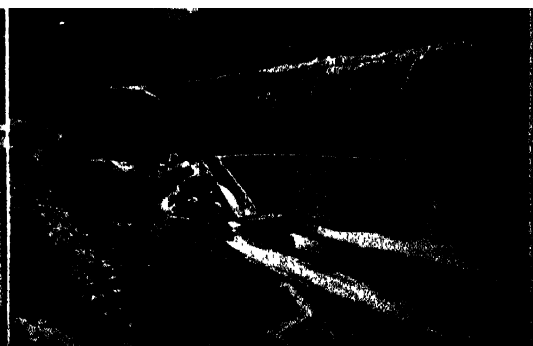
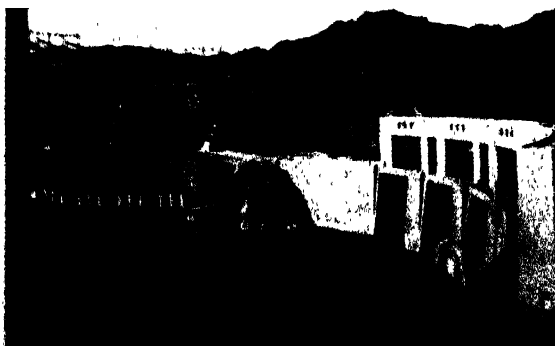
DAMS: Aerial view of Grand Coulee Dam, one of the world's largest concrete, straight gravity, overflow dams, showing pumping plant, discharge pipes, feeder canal, north dam and lake forming the Upper Grand Coulee equalizing reservoir.

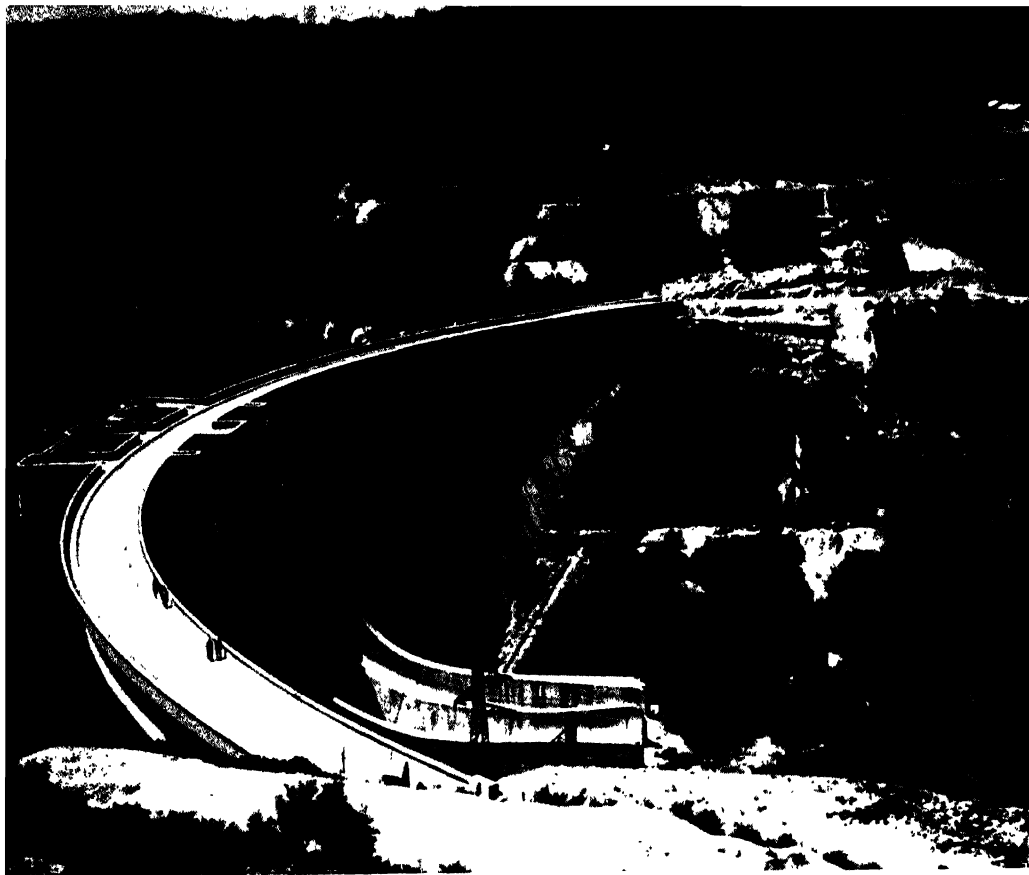


Above: Fontana Dam, concrete, straight gravity type.
Below: Parker Dam, concrete, arch, overflow type.
(Above) TVA; (below) Bureau of Reclamation



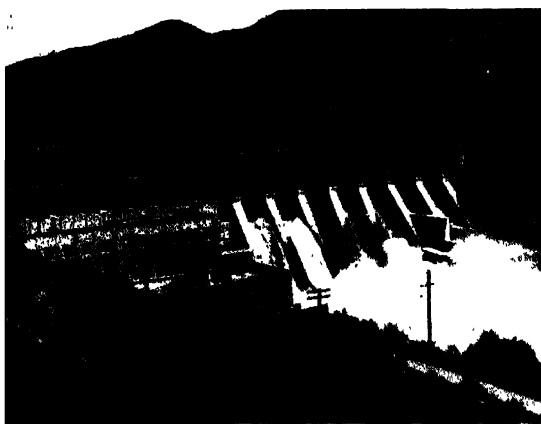
Above: Close-up of Davenport Dam, roller type.
Below: Boysen Dam, earth and rock fill type.
(Above) Ewing Galloway; (below) Bureau of Reclamation



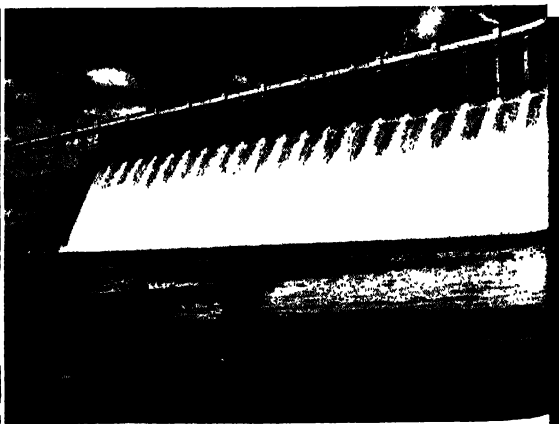


French Embassy Press and Information Division

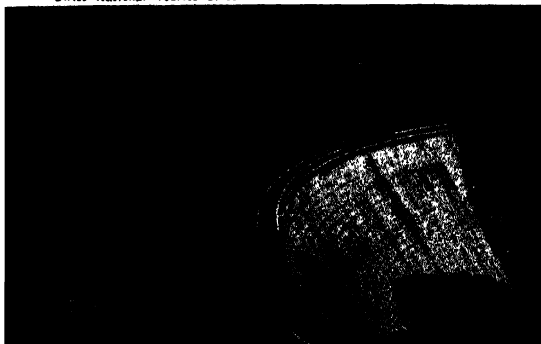
DAMS: Saint-Étienne-Cantalès Dam on the Cère River, France.



Above: Brilliant Dam in British Columbia, Canada
Below: Barberine Dam in Valais, Switzerland.
(Above) National Film Board of Canada; (below)
Swiss National Tourist Office



Above: Hume Dam, on the Murray River, Australia.
Below: Farkhad Dam, on the Syr Darya River, USSR.
(Above) Australian Information Bureau; (below) Sovfoto



The curved structure may also afford some advantage in providing additional length of spillway.

Arch Dam.—The term arch dam designates a monolithic concrete or masonry dam, curved upstream in plan, which in addition to resisting part of the pressure of the reservoir by its own weight, obtains stability by transmitting the remainder of the water pressure or load by arch action into the canyon walls. An arched masonry dam of thin section is adaptable to sites where the width between abutments is not great, and where the foundation at the abutments is solid rock capable of resisting arch thrusts.

Buttress Dam.—Dams under the general classification of buttress dams are composed of two principal structural elements: the sloping, water-supporting deck and the buttresses that support the deck. Although there are two specific types of buttresses, namely, single-wall and double-wall, the usual subclassification given for buttress dams distinguishes between types of water-supporting decks only. The various types of buttress dams are: (1) *Slab-and-buttress dam*. The deck for this type of dam is composed of flat slabs which are supported on corbels or transition sections at the upstream edge of the buttresses. The joints between the slabs and their supports are sealed with mastic filler for watertightness and flexibility. (2) *Multiple-arch dam*. The water-supporting deck for a multiple-arch dam consists of a series of arch-barrel segments supported by buttresses. The arched-deck construction has the ability to carry the load with a greater span between buttresses than is economically feasible for flat-slab construction. Since the arch abutments are rigidly reinforced into the buttresses, these dams are built on foundations which can carry the load without settlement. (3) *Massive-head dam*. This dam is formed by flaring the upstream edges of the buttresses to span the distance between buttress walls. The terms roundhead and diamond head, which refer to the enlargement at the upstream face, more fully describe this type. No massive head dams have been built in the United States, although several have been constructed in other countries, including the Don Martin Dam in Mexico and the Lauriston Dam in Australia. (4) *Multiple-dome dam*. This type of dam consists of hollow reinforced concrete domes resembling half an egg shell split along the axis and set on end. The domes are supported on the sides by the abutments and by buttresses.

Arch-Gravity Dam.—The arch-gravity dam is one in which both arch and gravity actions are effective. A portion of the water load is distributed into the abutments by arch action, the remainder into the foundation by cantilever action. In general, the cross section of an arch-gravity dam is similar to that of a straight gravity dam so that both gravity and arch actions contribute to stability of the structure. Arch-gravity dams are intermediate in structural character between curved gravity dams and arch dams, and usually are applicable to sites intermediate between the wide, flat valley typically adapted to a gravity dam and the narrow, rock gorge adapted to the arch dam.

High Masonry Dams.—The four highest and largest concrete dams in the United States have been built by the Bureau of Reclamation, United States Department of the Interior. Grand Coulee Dam on the Columbia River in Washington is

the largest. Second in size is Shasta Dam on the Sacramento River in California. Third is Hoover Dam on the Colorado River, which has the further distinction of being the highest completed dam in the world. The fourth largest is Hungry Horse Dam on the South Fork of the Flathead River in Montana.

Grand Coulee Dam, completed in 1942, is 550 feet high and 4,173 feet in length at the crest. It is of the straight-gravity type and contains, together with the appurtenant works, 10,585,000 cubic yards of concrete. The reservoir formed by the dam, Franklin D. Roosevelt Lake, extends 146 miles upstream to the Canadian border and has a capacity of 9,517,000 acre-feet. Water stored in this reservoir will be used to irrigate more than 1,000,000 acres of land, regulate the flow of the Columbia River, and develop 2,300,000 kilowatts of electrical energy to be used for pumping, irrigation, and other purposes.

Shasta Dam on the Sacramento River near Redding, California, completed in 1949, is 602 feet high and has a crest length of 3,460 feet. A curved-gravity dam, it contains with the appurtenant works, 6,541,000 cubic yards of concrete. It impounds 4,500,000 acre-feet of water in a reservoir operated to regulate the flow of the river for navigation improvement, flood control, irrigation, and electric-power generation. Shasta Dam is further distinguished by being the highest overflow type of dam in the world. Water falling over the 375-foot-wide spillway in the center of Shasta Dam has a drop of 480 feet.

Hoover Dam in the Black Canyon of the Colorado River was completed in 1936. The dam site is on the Arizona-Nevada boundary line, about 25 miles southeast of Las Vegas, Nevada. The dam is 726 feet in height above bedrock and has a crest length of 1,244 feet. It is an arch-gravity dam and, together with appurtenant works, it contains 4,400,000 cubic yards of concrete. Lake Mead, the reservoir formed by the dam, is 115 miles long and has a capacity of over 31,000,000 acre-feet. The dam is designed to control the flood waters of the Colorado River, provide irrigation for farming lands, control the silt carried down by the river, develop electric power, and provide water for domestic purposes.

Hungry Horse Dam on the South Fork of the Flathead River near Kalispell, Montana, construction of which was completed in 1952, is 564 feet high and has a crest length of 2,115 feet. It is of the arch type and has a volume of more than 3,000,000 cubic yards of concrete. The reservoir formed by the dam has a capacity for storage of 3,500,000 acre-feet of water. Operation of the reservoir provides flood protection and regulation of the flow of the river for power development.

Ross Dam, built by the City of Seattle, is a concrete arch structure 540 feet high, fifth highest dam in the United States. This dam was so constructed that it can be raised at a later date to its ultimate height of 675 feet.

Bartlett Dam on the Verde River in Arizona, completed by the Bureau of Reclamation in 1939, is the highest multiple-arch dam in the world. It is 287 feet high and 1,063 feet along the crest. Owyhee Dam in Oregon, another Bureau project, is an arch-gravity structure, 417 feet high and 833 feet long at the crest.

The highest of the Tennessee Valley Authority (TVA) dams is Fontana Dam, a concrete, straight-gravity structure, 480 feet high above

foundation and 2,385 feet long at the crest. It has a volume, together with appurtenant works, of 2,812,000 cubic yards. Norris Dam, another of the TVA dams, is 265 feet high and has a crest length of 1,860 feet. Other dams under the TVA are the Wilson Dam, at Muscle Shoals, Alabama, 137 feet high with a crest length of 4,680 feet; Chickamauga Dam, 129 feet high and 5,794 feet long at the crest; Wheeler Dam in Alabama, 72 feet high with a crest length of 6,335 feet; and Pickwick Landing Dam in Tennessee, 113 feet high and 7,715 feet in crest length.

The Coolidge Dam on the Gila River in Arizona is a multiple-dome dam. Constructed by the Office of Indian Affairs, Department of the Interior, in 1928, the dam rises 250 feet above streambed and consists of three reinforced concrete domes supported by massive buttresses spaced 180 feet center to center.

Large concrete dams completed by the United States Army Corps of Engineers include Pine Flat Dam in California, a gravity structure 440 feet high and 1,845 feet long; Detroit Dam in Oregon, a straight-gravity dam 440 feet high and 1,580 feet long, and Bull Shoals Dam in Arkansas, a straight-gravity dam 278 feet high and 2,349 feet long. Other concrete dams completed by the Corps of Engineers include Norfolk Dam in Arkansas, 244 feet high and 2,624 feet long; Tygart Dam in West Virginia, 232 feet high and 1,896 feet long; and Bluestone Dam in West Virginia, 200 feet high and 2,061 feet long.

Earth Dams and Rock-fill Dams.—The impounding embankment or earth dam is the most common type of dam now being constructed, because it does not require the same degree of structural competency of foundation as does the concrete dam and because the embankment material can often be economically obtained in the reservoir area or from other convenient sources near the dam site. The dam is usually placed across some drainage line between steep valley slopes to impound a reservoir in the valley upstream from the dam and to store a large proportion of the runoff. Earth dams, like concrete dams, require appurtenant structures which will: (1) serve as spillways to regulate the storage of water in the reservoir and to discharge safely a maximum flood from the drainage area; and (2) provide outlet works which will permit normal streamflow and operation of the reservoir for irrigation, power, flood control, municipal water supply, and other purposes.

Earth dams are constructed of carefully selected material, containing enough impervious soil to give it the required water-tightness and binding quality and enough pervious soil to assure stability. Most dams are built of readily available materials and are designed to utilize these materials most effectively in accordance with the principles of soil mechanics.

Earth dams may be classed according to the method of construction and the type of design. The terms "rolled fill," "hydraulic fill," and "semihydraulic fill" refer to different methods of construction. The terms "homogeneous embankment" and "zoned embankment" designate types according to design. Although numerous hydraulic-fill and semihydraulic-fill dams have been built, the roll-fill method of construction is now most widely used.

In rolled-fill construction the embankment material is spread and compacted by means of mechanical equipment. Some compactness is

attained by the movement of the trucks hauling the fill. The best compactness for impervious soils, however, is usually secured by tamping or by sheepfoot rollers.

In hydraulic and semihydraulic fills, the fill is placed by means of water. Although the control of deposit varies somewhat in the two types, the essential difference is that in the hydraulic method the material is excavated, transported, and placed hydraulically, and in the semihydraulic method the material is excavated mechanically and hauled to the site where it is dumped. It is then transported into place hydraulically.

The homogeneous embankment consists principally of reasonably uniform material throughout except for the gravel blanket and riprap on the upstream slope, possibly some pervious filter material on the downstream portion of the foundation, and topsoil for seeding on the downstream slope.

A zone embankment consists of an impervious core enclosed by outer layers of relatively pervious materials so zoned that the coarseness and perviousness increase toward the outer slopes. This type of design is dependent upon the availability of appropriate materials for selection and distribution in the embankment.

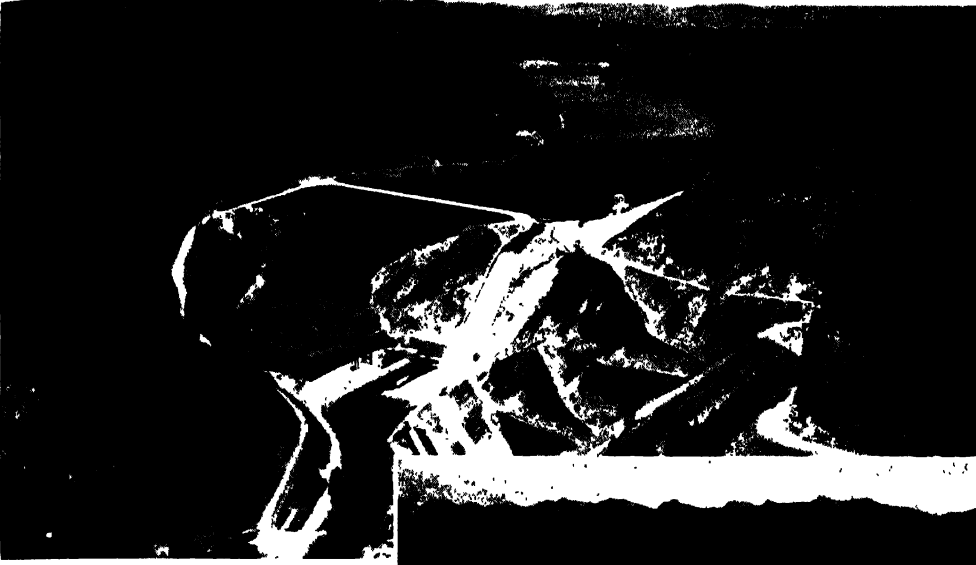
The earth- and rock-fill dam is a zoned embankment which contains a heavy rock fill on the downstream slope or on both the upstream and downstream slopes. There is usually a transition zone with particles of increasing coarseness as it approaches the rock fill, to prevent the fine material from penetrating into the rock fill. The weight and internal friction of the free draining rock allow steepening of the slopes of the underlying earth and increase the stability of the dam.

All earth dams are so designed that destruction through erosion of the embankments is minimized. This implies that the spillway capacity must surpass the peak flow for which it is designed; that overtopping by wave action at maximum high water must be prevented; that the original height of the structure must be sufficient to maintain minimum safe freeboard after settlement has occurred; and that erosion of the embankments due to surface runoff must not occur. These dams are also designed so that the foundation is structurally competent to support the load of the structure and that the flow of water through the dam is not so large that it will defeat the purpose of the structure. In addition, the water flow must not be at a pressure sufficiently high to cause movement of soil particles. In brief, the embankments must be stable under all conditions.

The slopes of earth dams may vary widely, depending on the foundation conditions, the materials available for construction, and the height of the dam. Homogeneous embankments usually require flatter slopes than zoned embankments. In some instances, the foundations of certain earth dams may require a larger cross-sectional width to obtain better distribution of stress.

Rock-fill dams, as well as the now almost obsolete brush and timber crib dams, were first developed when construction materials for other types of dams were not economically available. These dams are adapted to remote locations where suitable material for an earth dam is not available, where transportation of cement for a concrete dam to the dam site would be costly, or where the site or climate is not suitable for thin concrete structures.

DAMS



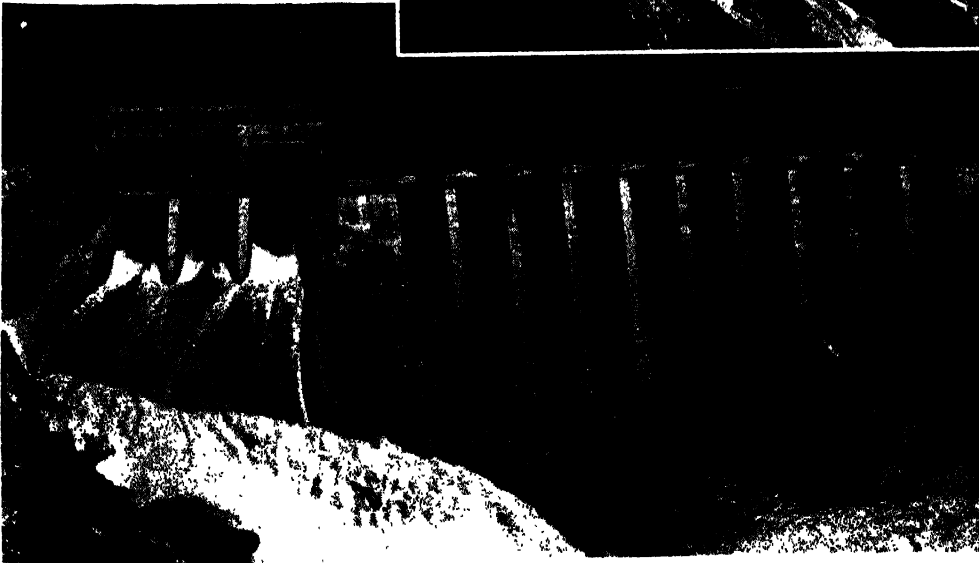
Above. Anderson Ranch Dam, earth fill type, on the South Fork of the Boise River in Idaho.

Right Hungry Horse Dam, concrete, arch gravity type, on the South Fork of the Flathead River in Montana



Bureau of Reclamation

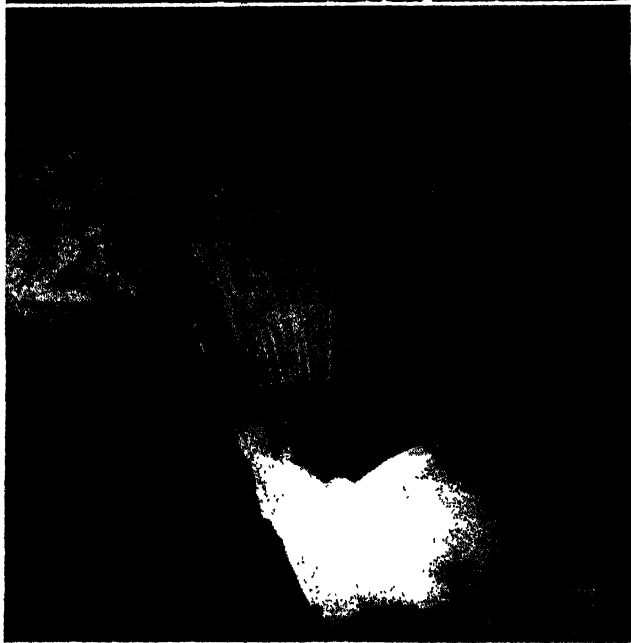
Below: Bartlett Dam, concrete, multiple arch type, on the Verde River in Arizona.



DAMS



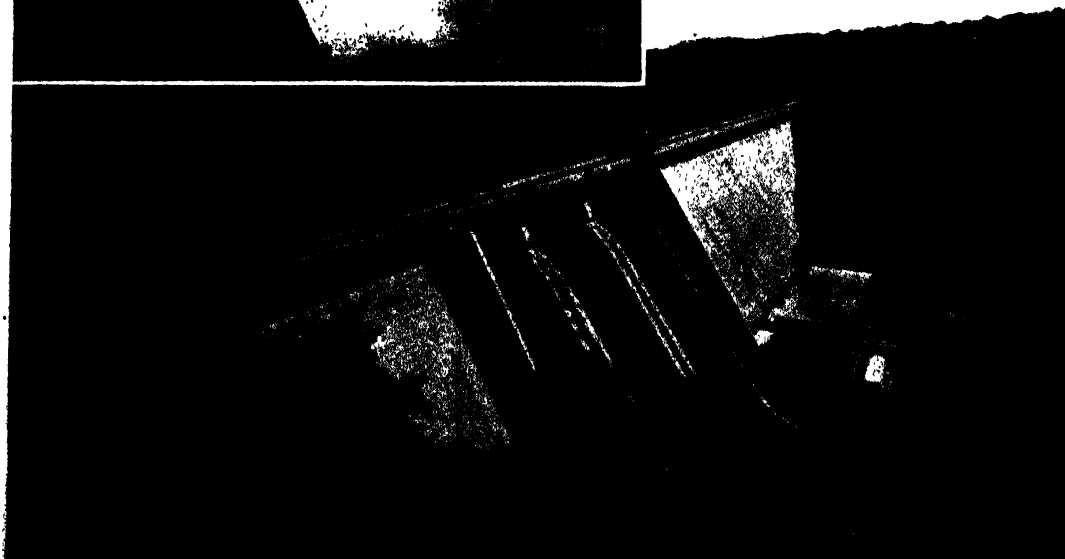
Above: Garrison Dam, earth fill type, on the Missouri River at Riverdale, North Dakota



Left: Hoover Dam, concrete, arch gravity type, on the Colorado River joining Arizona and Nevada

(Top) Corps of Engineers, U S. Army; (center) Bureau of Reclamation; (bottom) TVA

Below: Norris Dam, on the Clinch River in Tennessee, part of the Tennessee Valley Authority's extensive system. This is a concrete, straight gravity, overflow dam with earth fill wing.



The rock-fill structure is a modified form of the earth dam; rocks of all sizes to provide stability, together with an impervious membrane to assure watertightness, are utilized in the construction. The membrane may be a concrete slab, a steel plate facing, a timber deck, or other similar device. The materials used in the dam must resist crushing and exposure to air and water. They generally consist of granitic or volcanic rocks or hard durable sandstone or limestone obtained by blasting ledges in the vicinity of the structure.

The highest earth dam in the world is Anderson Ranch Dam constructed by the Bureau of Reclamation on the South Fork of the Boise River in Idaho. The dam is 456 feet high, 1,350 feet long, and has a volume of 9,653,300 cubic yards. The embankment was completed in October 1947.

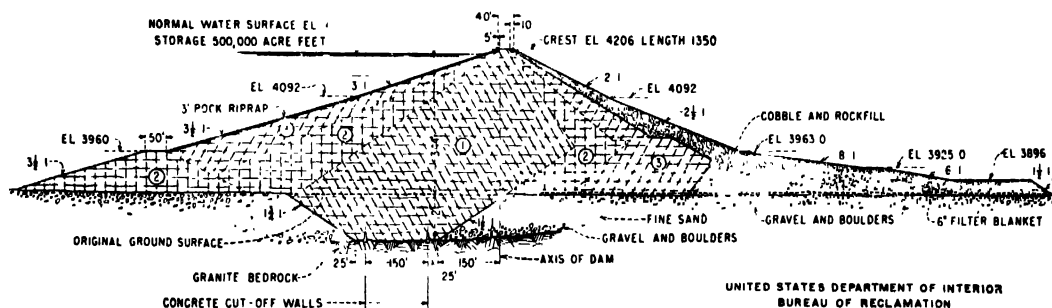
Mud Mountain (Stevens) Dam, completed by the United States Army Corps of Engineers, a rock- and earth-fill dam on the White River in the state of Washington, is 425 feet high.

Another high earth dam in the United States is the San Gabriel Dam No 1 in California which was completed by the Los Angeles County

the world. In the years following World War II, particularly, many remarkable high dams of bold design were built in Europe and Asia and in other continents to meet expanding needs for hydroelectric power, irrigation, flood control, water supply, and for other water resources development purposes. The following summarizes briefly some of the major accomplishments in dam construction throughout the world.

Switzerland.—This country has built some of the highest concrete dams in the world, principally for hydroelectric power production, including: Grimsel, 315 feet (1921); Schraeh, 366 feet (1925); Barbarine, 256 feet (1925); and Ratherichsboden, 276 feet (1951). Under construction in Switzerland in 1954 were two concrete dams which when completed will be the highest and second highest dams in the world. They are the Grand Dixence Dam, 912 feet, and the Mauvoisin Dam, 745 feet.

France.—Under the impetus of increased need for hydroelectric power production in the post-war period, France greatly expanded its dam construction. In 1951, 38 dams were reported under construction. New dams in France include these high concrete arch structures: Tignes, 592



Explanation (1) Impervious material of selected clay; or clay, sand, and gravel, rolled into compacted layers. (2) Semipervious material of selected stability, rolled in compacted layers. (3) Pervious material of suitable sand; or sand, gravel, and boulders, rolled as directed.

Shown above is a view of the cross section of Anderson Ranch Dam, highest earth-and-rock-fill dam in the world. The dam, constructed by the Bureau of Reclamation on the South Fork of the Boise River in Idaho, is representative of the zoned embankment type of dam construction. Measuring 456 feet in height above bedrock, 3,000 feet in cross-sectional width at streambed level, and 1,350 feet in crest length, the dam contains 9,653,300 cubic yards of earth and rock material.

Flood Control District in 1938. It is 381 feet high, 1,540 feet long, and has a volume of 10,641,000 cubic yards.

Fort Peck Dam on the Missouri River in Montana, completed by the United States Army Corps of Engineers in 1940, is the largest earth dam in the world. Of the hydraulic-fill type, it has a volume of 128 million cubic yards. It is 21,026 feet long and 250 feet high, the reservoir holding 19,417,000 acre-feet of water.

Two other large earth dams were under construction in 1954 by the Corps of Engineers: the Oahe Dam on the Missouri River in South Dakota, with a volume of 78 million cubic yards; and Garrison Dam, also on the Missouri River, in North Dakota, with a volume of 75 million cubic yards.

The Salt Springs Dam in California, largest and highest rock-fill, concrete-faced dam in the United States, is 328 feet high, 1,260 feet long, and contains 3,171,500 cubic yards of fill. The dam was completed in 1931 by the Pacific Gas and Electric Company.

Dams in Foreign Countries.—The progress in the construction of high dams in the United States has been paralleled in other countries of

feet; Bort-les-Orgues, 394 feet; and St. Etienne-Cantales, 230 feet. Completed earlier were these concrete dams: Chambon, 450 feet (1934); Sautet, 414 feet (1934); L'Aigle, 296 feet (1947); and Genissiat, 345 feet (1948).

Italy.—This country's recent expansion of its industrial resources has occasioned the development of new major hydroelectric power projects which have high dams as their principal elements. Among these are the following important concrete arch structures: Lumei, 440 feet (1947); Valle di Cadore, 200 feet (1950); Pieve di Cadore, 368 feet (1950); Val Gallina, 305 feet (1951); and Santa Giustina, 500 feet (1952). Previously, in the years following World War I, Italy had built seven multiple arch concrete dams, including Tirso, 239 feet high, and Tidone, 171 feet high.

Spain and Portugal.—Spain, in which the oldest existing masonry dams were built about 350 years ago, has a large number of high masonry dams. Among these are: Camarasa, 333 feet; Talarn, 328 feet; Prince Alfonso, 238 feet; and Montejaque, 236 feet.

In Portugal, the Castelo do Bode Dam, a concrete arch structure, 380 feet high, was com-

pleted in 1951. Another new Portuguese concrete arch dam is the Venda Nova, 300 feet high. Reported as under construction in 1952 was the Santa Luzia Dam, a concrete structure, 247 feet high.

Construction of high dams in Europe is typified also by Limberg Dam in Austria, a concrete arch structure, 394 feet high, completed in 1951, and by the Eupen Dam in Belgium, a curved concrete dam 214 feet in height. In the British Isles, Scotland is developing several large hydroelectric power projects. Representative of present-day dam construction on these Scottish Highlands projects are the Errochty, Pitlochry, Loch Sloy, and Clunie dams, all large concrete dams.

India.—India has long been noted for dam construction in the development of its water resources, particularly for irrigation and hydroelectric power purposes. When completed in 1928, Lloyd Dam was one of the largest masonry dams in the world; it has a height of 190 feet and a volume of 796,000 cubic yards. Another of the large masonry dams is Tungabadra, having a volume of 1,200,000 cubic yards. Mettur Dam, of concrete (2,000,000 cubic yards), and Poona and Tansa dams, of masonry, are other large Indian dams.

In the valley of the Damodar River which extends over 300 miles westward from Calcutta, five dams (both earth and concrete) were under construction in 1954. Among these dams are Konar Dam (earth), 160 feet high and 12,600 feet long exclusive of a 900-foot concrete spillway section, and Tilaiya Dam (concrete gravity), 112 feet high and 1,150 feet long.

The Mahanadi Valley Project had three big dams under construction in 1954, including Hirakud, with a main earth-fill section 15,800 feet long and 17 miles of dikes. In the front range of the Himalayas, Bhakra Dam, key structure in one of India's greatest irrigation-power developments, was under construction at the same time. This is a concrete structure 680 feet high and will have a volume of more than 5 million cubic yards.

Australia.—This country has several large dams completed and under construction. Hume Dam, an earth and concrete dam about one mile long, was completed in 1931. Burrinjuck (1927) is a concrete dam 247 feet high. Virtually completed in 1954 was the Great Eildon Dam, an earth- and rock-fill structure having a volume of 13 million cubic yards. Under construction near Sydney in the same year was Warragamba Dam, a concrete gravity structure, 400 feet high above river bed. When completed it will be the highest dam in the Southern Hemisphere.

One of the world's largest hydroelectric-irrigation developments—the Snowy Mountains Project—was under construction elsewhere in Australia at the same time. This transmountain diversion project includes seven major dams, among them the Tumut Pond Dam, a concrete arch structure about 300 feet high, and Aaminaby Dam, an earth- and rock-fill dam about 400 feet high.

Western Hemisphere.—Canada has several dams of impressive proportions, including: Stewartville, concrete, 206 feet; Scanlon, concrete, 195 feet; Kenney, earth- and rock-fill, 300 feet; Nechako, rock-fill, 317 feet; and St. Mary, earth, 191 feet high. In 1954 Mexico was constructing the Alvaro Obregón Dam, a large earth dam having a volume of about 11 million

cubic yards. Completed in 1948 was Mexico's earth Lázaro Cárdenas Dam, 302 feet high and having a volume of about 7 million cubic yards. The Dique La Viña in Argentina, a concrete arch dam 345 feet high, was reported in 1942 to be South America's highest dam. Chile has the Cogoti Dam, rock fill, 247 feet high.

Notable dams in other countries of the world include: Aswân in Egypt, rubble masonry, 175 feet high, and 6,400 feet long; Gal Oya in Ceylon, earth, 6 million cubic yards, 154 feet high; Sarkarya in Turkey, a concrete dam 350 feet high, reported nearing completion in 1954; Bin el Ouidane in French Morocco, concrete arch, 430 feet high, completed in 1954; and Kajakai in Afghanistan, earth, 295 feet high, completed in 1953.

Movable Dams and Gates.—Movable dams are of two general classes: (1) automatic dams, and (2) those operated by external power. The first group includes bear-trap dams; in the second are bridge dams, shutter and wicket dams, roller dams, frame dams, and curtain dams.

The bear-trap dam was first used on the Lehigh River in Pennsylvania early in the 19th century. It consisted of a timber platform at or near the level of the stream bed, with two leaves overlapping. The top leaf was hinged at its upstream edge to the floor of the dam. The under leaf was similarly hinged at its downstream edge. By introducing water beneath through a regulating sluice, these leaves rose with the head of water above until they reached the proper height in the form of a flat A dam. The bear-trap dam has been variously altered and made as long as 60 feet.

A notable application of the movable dam is the so-called "Chicago" bear-trap, 160 feet long, at Lockport, Illinois. This structure is made of steel and is hinged at the top angle, the upper leaf dropping in front of a breast wall. It has a range of 15 feet and is so counterweighted and controlled that the depth flowing over is practically uniform at any elevation, and can be operated by one man.

Bridge dams consist of a permanent bridge with openings between the piers closed by some form of gates supported directly by the piers.

The shutter or wicket dam consists of shutters several feet in width and of the length desired set side by side. The lower edge of the shutters rests against a sill and is supported by a prop behind, the shutter tipping automatically and falling to the river bed when the depth over top exceeds a certain limit. The shutters are raised by means of a windlass from a service bridge or boat. This type of dam is used on the Ohio and Great Kanawha rivers.

Roller dams are formed by a massive cylinder and a projecting apron, the cylinder having a diameter approximately equal to the desired height. The dam is opened by rolling the cylinder bodily up inclined tracks laid at both ends of the dam. In a dam of this type built on the Yakima River in Washington, the cylinder is 14 feet in diameter and closes an opening 110 feet across.

Frame dams are essentially bridge dams in which the bridge itself is movable. In its simplest form, the frame dam consists of a series of A-shaped frames set closely side by side. These are arranged to drop down sidewise nesting one in another. They are raised by a chain connecting the peaks of the A-frames.

DAMS IN THE UNITED STATES OVER 200 FEET HIGH
Ranked in Order of Height

Compiled by the United States Department of the Interior, Bureau of Reclamation, April 1954

Name of Dam	State	River	Type	Height	Length	Volume	Purpose	Year	Owner or Controlling Agency
Hoover Shasta	Arizona-Nevada California	Colorado Sacramento	Concrete, arch gravity	726	1,244	4,400,000	FC-I-P-RR	1936	Bureau of Reclamation
Hungry Horse	Montana	South Fork, Flathead	Concrete, curved gravity, over- flow, earth-fill wing	602	3,460	6,541,000	FC-I-P	1945	Bureau of Reclamation
Grand Coulee	Washington	Columbia	Concrete, arch gravity	564	2,115	3,086,000	I-FC-P	1952	Bureau of Reclamation
Ross	Washington	Skagit	Concrete, straight gravity, overflow	550	4,173	10,595,000	I-P-RR-FC	1942	Bureau of Reclamation
Fontana	California	Little Tennessee	Concrete, arch	540	1,725	3,792,000	P	1949	City of Seattle
Anderson Ranch	North Carolina	South Fork, Boise	Concrete, straight gravity	480*	2,385	2,812,000	FC-P	1944	Tennessee Valley Authority
Pine Flat	Idaho	Kings	Earth fill	456	1,350	9,653,300	FC-I-P	1950	Bureau of Reclamation
Detroit	California	North Santiam	Concrete, gravity	440	1,845	2,240,000	FC-I-P	1954	Army Engineers
O'Shaughnessy ⁴	Oregon	Tuolumne	Concrete, straight gravity	440	1,580	1,670,000	FC-N-P	1953	Army Engineers
	California		Concrete, arch gravity	430	540	675,000	WS-P	1923	City and County of San Francisco
Mud Mountain (Stevens)	Washington	White	Rock and earth fill	425	700	2,230,000	FC	1948	Cisco Army Engineers
Owyhee	Oregon	Owyhee	Concrete, arch gravity	417	833	537,200	I	1932	Bureau of Reclamation
Diablo	Washington	Skagit	Concrete, arch	386	1,180	350,000	P	1930	City of Seattle
San Gabriel No. 1	California	San Gabriel	Rock and earth fill	381	1,540	10,641,000	FC	1938	Los Angeles County Flood Control District
Pacoina	California	Pacoina Creek	Concrete, arch	372	640	225,300	FC	1928	Los Angeles County Flood Control District
Pardee	California	Mokelumne	Concrete, curved gravity	358	1,337	615,000	WS	1929	East Bay Municipal Utilities District
Arrowrock ¹	Idaho	Boise	Concrete, arch gravity	350	1,150	636,000	I	1915	Bureau of Reclamation
Dam No. 22	Colorado	South Boulder Creek	Concrete, arch gravity	340	1,050	628,000	WS	1915	Denver Board of Water Commissioners
Alder	Washington	Nisqually	Concrete, arch	330	1,600	440,000	P	1944	City of Tacoma
Morris	California	San Gabriel	Concrete, straight gravity	328	780	446,000	WS	1934	City of Pasadena
Salt Springs	California	North Fork, Mokelumne	Rock fill, concrete facing	328	1,260	3,171,500	P	1931	Pacific Gas and Electric Company
Exchequer	California	Merced	Concrete, curved gravity	326	943	390,600	I-P	1926	Merced Irrigation District
Buffalo Bill (Shoshone)	Wyoming	Shoshone	Concrete, arch	325	200	82,900	I-P	1910	Bureau of Reclamation
Parker Friant	Arizona-California California	Colorado San Joaquin	Concrete arch, overflow	320	856	380,000	WS-P	1938	Bureau of Reclamation
Watauga	Tennessee	Watauga	Concrete, straight gravity, overflow	319	3,488	2,134,700	I-FC	1944	Bureau of Reclamation
Ariel	Washington	Lewis	Earth and rock fill	318	900	3,334,500	FC-P	1949	Tennessee Valley Authority
Green Mountain Hiwassee	Colorado	Blue	Concrete, arch	313	1,250	307,000	P	1931	Pacific Power and Light Company
Kensico	North Carolina	Hiwassee	Earth fill	309	1,150	4,406,000	I-P	1943	Bureau of Reclamation
Elephant Butte	New York	Bronx	Concrete, straight gravity, overflow	307*	1,287	807,200	FC-P	1940	Tennessee Valley Authority
Horse Mesa	New Mexico	Rio Grande	Masonry, straight gravity	307	1,845	900,000	WS	1916	City of New York
Seminole	Wyoming	North Platte	Concrete, arch	295	885	629,400	I-P	1916	Bureau of Reclamation
Granby	Colorado	Putah Creek	Concrete, straight gravity	295	1,000	162,900	I-P	1927	Salt River Valley Water Users' Association
Monticello	California	Croton	Concrete, arch	295	530	210,200	I-P	1939	Bureau of Reclamation
New Croton	New York	West Fork, San Gabriel	Masonry, straight gravity, earth-fill wing	295	885	2,901,300	I-RR	1949	Bureau of Reclamation
San Gabriel No. 2	California	Verde	Rock fill, timber facing	294	2,200	855,000	WS	1906	City of New York
Bartlett	Arizona	South Fork, Holston	Concrete, multiple arch	287	1,063	182,300	I-FC	1935	Los Angeles County Flood Control District
South Holston	Tennessee		Earth and rock fill	285	1,600	5,943,000	FC-P	1939	Bureau of Reclamation
								1951	Tennessee Valley Authority

DAMS IN THE UNITED STATES OVER 200 FEET HIGH—Continued

Ranked in Order of Height

Compiled by the United States Department of the Interior, Bureau of Reclamation, April 1954

Name of Dam	State	River	Type	Height	Length	Volume	Purpose	Year	Owner or Controlling Agency
Don Pedro	California	Tuolumne	Concrete, curved gravity	284	1,040	296,600	I-P	1923	Turlock and Modesto Irrigation District
Roosevelt	Arizona	Salt	Masonry, arch gravity	280	1,125	355,800	I-P-FC	1911	Bureau of Reclamation
Cushman No. 1	Washington	North Fork, Skokomish	Concrete, arch, earth-fill wing	280	1,200	90,000*	P	1926	City of Tacoma
Winsor	Massachusetts	Swift	Earth fill	280	2,640	4,000,000	WS	1939	Metropolitan Water Supply District of Boston
Morena	California	Cottonwood Creek	Rock fill, concrete facing	279	550	335,000	WS	1930	City of San Diego
Bull Shoals	Arkansas	White	Concrete, straight gravity	278	2,349	2,100,000*	FC-P	1952	Army Engineers
Marshall Ford	Texas	Colorado	Concrete, straight gravity, overflow, earth-fill wings	278	5,128	3,389,000	I-P-FC-RR	1942	Lower Colorado River Authority and Bureau of Reclamation
Lake Spaulding	California	South Fork, Yuba	Concrete, arch	275 ⁴	800	191,800	P	1919	Pacific Gas and Electric Company
Dix River	Kentucky	Dix	Rock fill, concrete facing	275	1,020	1,747,000	P	1925	Kentucky Hydro Electric Company
Table Rock	Missouri	White	Concrete, gravity	272	4	4	FC-P	1	Army Engineers
El Capitan	California	San Diego	Earth fill, semihydraulic, and rock fill	270	1,200	2,679,700	WS	1935	City of San Diego
Folsom	California	American	Earth fill	268	1,500	14,000,000	FC-I-P	1	Army Engineers
Norris	Tennessee	Clinch	Concrete, straight gravity, overflow, earth-fill wing	265*	1,860	1,184,000	FC-P	1936	Tennessee Valley Authority
Alcova	Wyoming	North Platte	Earth fill	265	763	1,635,300	I	1938	Bureau of Reclamation
Shannon	Washington	Baker	Concrete, curved gravity, overflow	263	493	132,000	P	1925	Puget Sound Power and Light Company
Cobble Mountain	Massachusetts	Little	Earth fill, semihydraulic	263	730	1,799,200	WS-P	1932	City of Springfield
Palisades	Idaho	Snake	Earth fill	260	2,100	13,693,000	I-P-FC	1	Bureau of Reclamation
Upper Narrows	California	Yuba	Concrete, arch	260	1,142	380,000	DC	1941	Army Engineers
Lake Pleasant	Arizona	Agua Fria	Concrete, multiple arch	256	2,210	98,400	I	1927	Maricopa County Municipal Water Conservation District No. 1
Ashokan	New York	Esopus Creek	Masonry, straight gravity, earth-fill wings	252	4,650	2,471,900	WS	1912	City of New York
Big Tujunga No. 1	California	Big Tujunga Creek	Concrete, arch, earth-fill wing	251	800	80,000*	FC	1931	Los Angeles County Flood Control District
Coolidge	Arizona	Gila	Concrete, multiple-dome	250 ⁴	860	204,000	I-P	1928	Office of Indian Affairs
Fort Peck	Montana	Missouri	Rock fill, hydraulic	250 ⁴	21,026	128,000,000	FC-P-N	1940	Army Engineers
Nantahala	North Carolina	Nantahala	Rock fill	250	1,042	1,829,000	P	1942	Aluminum Company of America
Look-out Point	Oregon	Middle Fork, Willamette	Earth and gravel fill	250	3,106	10,600,000	FC-N-P	1954	Army Engineers
Long Lake	Washington	Spokane	Concrete, straight gravity, overflow	247	350	225,000	P	1915	Washington Water Power Company
Center Hill	Tennessee	Caney Fork	Concrete, straight gravity, earth-fill wings	246	2,172	3,540,000*	FC-P	1952	Army Engineers
Norfolk	Arkansas	North Fork	Concrete, straight gravity	244	2,624	1,500,000	FC-P	1944	Army Engineers
Kortes	Wyoming	North Platte	Concrete, straight gravity	240	440	147,000	P	1950	Bureau of Reclamation
Dixon Canyon	Colorado	Offstream	Earth and rock fill	240	1,265	3,004,000	I	1949	Bureau of Reclamation
Cushman No. 2	Washington	North Fork, Skokomish	Concrete, arch	240	500	38,000	P	1931	City of Tacoma
Wolf Creek	Kentucky	Cumberland	Concrete, straight gravity, overflow, earth-fill wing	240	5,736	10,250,000	FC-P	1952	Army Engineers
Conchas	New Mexico	South Canadian	Concrete, straight gravity, overflow, earth-fill wings	235	6,230	1,723,000	FC-I	1940	Army Engineers
Deer Creek	Utah	Provo	Earth fill, straight gravity	235	1,304	2,827,900	I-WS	1941	Bureau of Reclamation
Teton	Washington	Tieton	Earth fill, semihydraulic	235	620	2,045,900	I	1925	Army Engineers
Emill	Mississippi	Yazoo	Earth fill	232	1,100	3,897,400	FC	1	Army Engineers

DAMS AND LEVEE UNITS OVER 200 FEET HIGH—Continued
Ranked in Order of Height
Compiled by the United States Department of the Interior, Bureau of Reclamation, April 1954

Name of Dam	State	River	Type	Height	Length	Volume	Purpose	Year	Owner or Controlling Agency
Tygart	West Virginia	Tygart	Concrete, straight gravity, overflow	232	1,896	1,241,000	FC-N	1938	Army Engineers
Cheesman	Colorado	South Platte	Masonry, curve gravity	232	710	103,000	WS	1904	Denver Board of Water Commissioners
Boysen Salmon River	Wyoming	Big Horn	Earth and rock fill	230	1,010	1,661,000	I-P	1932	Bureau of Reclamation
	Idaho	Salmon	Concrete, curved gravity	230	480	729,900	I	1914	Twin Falls-Salmon River Land and Water Company
Oahe	South Dakota	Missouri	Rolled earth fill	230	9,300	78,000,000	FC	1932	Army Engineers
Mount Morris	New York	Genesee	Concrete gravity	230	1,000	755,000	FC	1919	Army Engineers
Cheeah	North Carolina	Little Tennessee	Concrete, arch, overflow	230	770	200,000	P	1919	Aluminum Company of America
Calderwood	Tennessee	Little Tennessee	Concrete, arch, overflow	230	897	280,000	P	1930	Aluminum Company of America
Blakely Mt.	Arkansas	Ouachita	Earth fill	230	1,200	4	FC	1933	Army Engineers
Copco No. 1	California	Klamath	Concrete, curved gravity	227	415	70,300	P	1922	California-Oregon Power Company
Soldier Canyon	Colorado	Offstream	Earth and rock fill	226	1,438	3,288,000	I	1949	Bureau of Reclamation
Big Santa Anita	California	Big Santa Anita Creek	Concrete, arch	225	605	76,200	FC	1927	Los Angeles County Flood Control District
Pactola	South Dakota	Rapid Creek	Earth fill	225	1,250	3,200,000	FC-I-WS	1	Bureau of Reclamation
Mormon Flat	Arizona	Salt	Concrete, arch	224	505	56,700	I-P	1925	Salt River Valley Water Users' Association
Lake Loveland	California	Sweetwater	Concrete, arch	224	783	4	I-WS	1945	California Water and Telephone Company
Madden ¹ (Canal Zone)	Panama	Chagres	Concrete, straight gravity, overflow, earth-fill wing	223	3,674	523,800 ^b	N-FC-P	1935	Panama Canal Zone
Bouquet Canyon	California	Bouquet Creek	Earth fill, concrete facing	221	1,150	2,890,300	WS-P	1934	City of Los Angeles
Philpott	Virginia	Smith	Concrete, gravity	220	920	330,000	FC-P	1953	Army Engineers
Calaveras	California	Calaveras Creek	Earth fill, hydraulic	220	1,200	3,461,000	WS	1923	City and County of San Francisco
Upper San Leandro	California	San Leandro Creek	Earth fill, hydraulic	220	660	1,248,000	WS	1926	East Bay Municipal Utilities District
Stone Canyon	California	Stone Canyon Creek	Earth fill, oiled facing	220	567	729,900	WS	1924	City of Los Angeles
Canyon Ferry	Montana	Missouri	Concrete, straight gravity	220	1,000	390,000	P-I-FC	1933	Bureau of Reclamation
Yadkin	North Carolina	Yadkin	Concrete, arch, gravity, overflow	217	1,400	525,000	P	1919	Aluminum Company of America
La Grande	Washington	Nisqually	Concrete, curved gravity, overflow	215	710	84,500	P	1945	City of Tacoma
Spring Canyon	Colorado	Offstream	Earth and rock fill	215	1,120	2,213,000	I	1949	Bureau of Reclamation
Pathfinder	Wyoming	North Platte	Masonry, arch gravity	214	1,070	65,700	I	1913	Bureau of Reclamation
Muholland	California	Weid Canyon	Concrete, curved gravity	210	933	175,000	WS	1925	City of Los Angeles
Allatoona	Georgia	Etowah	Concrete, gravity	210	1,210	4	FC-P	1949	Army Engineers
Gilnes Canyon	Washington	Elwha	Concrete, arch, overflow, earth-fill wing	210	508	24,600 ^b	P	1927	Crown Zellerbach Corporation
Garrison	North Dakota	Missouri	Earth fill	210	12,000	75,000,000 ^b	FC-I-N	1	Army Engineers
Mathews (Calalco)	California	Cajalco Creek	Earth fill, concrete ^c facing	210	2,170	3,175,000	WS	1938	The Metropolitan Water District of Southern California
Wachusett	Massachusetts	South Fork, Nashua	Masonry, straight gravity	208	1,476	274,200	WS	1906	Metropolitan Water Supply District of Boston
Saluda	South Carolina	Saluda	Earth fill, semihydraulic	208	7,838	11,160,800	P	1930	Lexington Water Power Company
Stewart Mountain	Arizona	Salt	Concrete, arch	207	1,260	131,700	I-P	1930	Salt River Valley Water Users' Association
Cachuma	California	Santa Ynez	Earth fill	206	2,975	6,625,000	FC-I	1953	Bureau of Reclamation
Kentucky	Kentucky	Tennessee	Concrete, straight gravity, overflow, earth-fill wings	206*	8,422	8,518,700	FC-N-P	1944	Tennessee Valley Authority
Taylor Park	Colorado	Taylor	Earth fill	206	675	1,115,100	I	1937	Bureau of Reclamation
Tiber	Montana	Lower Marias	Earth fill	205	4,500	11,363,590	FC-I	1	Bureau of Reclamation

DAMS IN THE UNITED STATES OVER 200 FEET HIGH—Continued

Ranked in Order of Height

Compiled by the United States Department of the Interior, Bureau of Reclamation, April 1954

Name of Dam	State	River	Type	Height	Length	Volume	Purpose	Year	Owner or Controlling Agency
San Pablo	California	San Pablo Creek	Earth fill, hydraulic, and rock fill	205	1,250	2,200,000	WS	1921	East Bay District
Cedar Bluff	Kansas	Smoky Hill	Earth fill	204	12,570	8,781,000	I-FC	1951	Bureau of Reclamation
Douglas	Tennessee	French Broad	Concrete, straight gravity, overflow	202 ^a	1,705	1,171,000	FC-P	1943	Tennessee Valley Authority
Bluestone	West Virginia	New	Concrete, gravity	200	2,061	950,000	FC-P	1948	Army Engineers
Neverank	New York	Neversink	Earth fill	200	2,800	750,000	WS	1954	City of New York
Clark Hill	Georgia	Savannah	Concrete, straight gravity, earth-fill wing	200	5,660	4,300,000	FC-P	1949	Army Engineers
O'Sullivan	Washington	Offstream	Rolled earth embankment	200	19,000	9,245,000	I	1949	Bureau of Reclamation
Santetan	North Carolina	Cheoah	Concrete, arch	200	1,150	195,000	P	1928	Aluminum Company of America
Kerr (Polson)	Montana	Flathead	Concrete, arch	200	350	77,000	P-I	1938	Montana Power Company
Bull Run	Oregon	Bull Run	Concrete, arch gravity	200	935	220,000	WS	1929	City of Portland
Dale Hollow	Tennessee	Obeys	Concrete, straight gravity	200	1,717	500,000	FC-P	1943	Army Engineers
Martin	Alabama	Tallapoosa	Concrete, arch, overflow, earth-fill wing	200	2,000	440,000	P-RR	1926	Alabama Power Company
Merriman	New York	Roundout Creek	Earth fill	200	2,450	7,953,000	WS	1942	City of New York
Davis	Arizona-Nevada	Colorado	Rock and earth fill	200	1,300	4,357,500	P-RR-I	1949	Bureau of Reclamation
Ralston	Colorado	Ralston Creek	Earth fill	200	1,150	2,500,000	WS	1938	Denver Board of Water Commissioners
Davis Bridge	Vermont	Deerfield	Earth fill, semihydraulic	200	1,250	1,850,000	P	1924	New England Power Company
Lake Arrowhead	California	Little Bear Creek	Earth fill, semihydraulic	200	850	1,300,000	I-P	1911	Arrowhead Lake Company
Waterville	North Carolina	Big Pigeon	Concrete, arch	200	870	184,200	P	1930	Carolina Power Company

Definitions

Height — Difference in elevation, in feet, between lowest point in foundation and top of dam, exclusive of parapet or other projections

Length — Over-all length of barrier in feet; main dam and its integral features as located between natural abutments

Volume — Total volume in cubic yards of all material in main dam and its appurtenant work

Purpose — I — Irrigation
 P — Power production
 FC — Flood control
 N — Navigation
 WS — Water supply
 RR — River regulation
 DC — Debris control

Year — Date structure was originally completed for use (tabular data include subsequent enlargements).

Symbols

¹ Under construction, data subject to revision² Height increased 85 feet in 1938³ Height increased 5 feet in 1937⁴ Data not available⁵ Data apply to main dam only^a Height above foundation, measured at axis of dam^b Volume of concrete or masonry only^c Volume in dam only^d Height above stream bed

Notes

Definitions stated were adopted to provide comparable data on the dams listed. Data given for some dams may be subject to correction, as adequate information was not available.

Curtain dams have an operating bridge with a series of frames hinged to the bridge at the top. These can be lowered until the other end abuts against a stop on the dam floor. The actual closure is effected by curtains of horizontal bars of wood hinged together on their upstream side, the lower bars being heavier. A rolling shoe of iron is attached to the lowest bar, and an endless chain passes around the curtain at its center. The curtain is rolled up by a windlass operating the chain. The original curtain dam was the Port Villes Dam across the Seine River, 90 miles below Paris; it is 700 feet long and about 10 feet high.

Gates which are used as appurtenant works in large dams for the regulation of the flow of water over spillways and for the closure of the flow through outlet conduits may be classed as movable dams. Such a gate provides a means for controlling the water surface above the crest in the spillway of a dam, and thus permits either an increase in the active storage capacity of the reservoir and an increased operating head at the turbines in the power plant, or regulation of the reservoir in the event of impending floods. Examples of these gates are plane-faced structural steel gates, drum gates, and radial (or Taintor) gates.

A plane-faced structural steel gate consists primarily of a skinplate supported by horizontal beams which in turn are supported by vertical girders at the sides. On a sliding gate, guide shoes are located on each side of the gate and operate over continuous guides embedded in concrete. The water load on the gate is transmitted to structural frames embedded in concrete near the edges of the water passage. Sliding gates are commonly used for relatively low heads. For higher heads, the friction of sliding gates becomes excessive, and the gates are mounted on wheels or roller trains.

Drum gates are hinged at their upstream edges. Their upstream faces are curved to coincide with the spillway crests; their downstream faces are cylindrical segments with radii centered in the hinge line; and their third or bottom faces lie in planes. Drum gates are buoyant and float in recesses or chambers in the spillway crests. They are operated by reservoir pressure, which eliminates the need of hoists or external power supply. The control of the water in the chamber is either automatic, manual, or remote electric.

Radial, or Taintor, gates are formed by a portion of a cylinder which rotates on its axis, the cylindrical surface forming the closure member of the gate. All hydraulic forces are carried through spokes or arms to a fixed axis of the gate. This type of gate is usually used at a spillway crest of a dam to regulate the flow of water in irrigation canals. The gates are normally hoisted by a two-drum, manually- or power-operated wire rope hoist, the hoisting ropes being connected to the lower side of the gate. They also may be operated automatically through the use of counterweights and floats.

A diversion dam on the Rhone River in France, a feature of the Donzere-Mondragon Project, has the world's longest Taintor gate—a 148-foot span.

Submerged gates are used on the upstream face of structures where reservoir pressure can act downward on the area represented by the plane of the gate. High-head penstock inlets

and inlets to reservoir outlet conduits are typical applications. When used as penstock inlet gates, they are suspended immediately above the inlet and operated by hydraulic hoists so that closure can be made in a relatively short time.

A roller-mounted gate is usually used for emergency operation, or for regulation if closing is required under load. Wheels are mounted on the vertical girders of the gate and transmitted to water load on two tracks mounted on structural beams embedded in concrete at the sides of the structure.

Examples of gates installed on Bureau of Reclamation structures include the following: five 50- by 50-foot plane-faced structural steel, roller train gates at Parker Dam, Arizona-California; eleven 135- by 28-foot drum gates at Grand Coulee Dam, Washington; eight 100- by 16-foot drum gates at Hoover Dam, Arizona-Nevada; and six 50- by 30-foot radial gates at Eiders Dam, Nebraska.

Steel Dams.—Examples of steel dams constructed in the United States are the Ash Fork Dam in Arizona, 184 feet long and 46 feet high, completed in 1898, and the Redbridge Dam in Michigan, 464 feet long and 74 feet high, completed in 1901.

See also IRRIGATION; WATER POWER.

W. A. DEXHEIMER,

Commissioner of Reclamation, United States Department of the Interior.

DAMSON, dām'zūn, the tree *Prunus insititia* of the family Rosaceae; also the fruit of the tree, a small, firm-fleshed, clustered, dark-purple plum. Originating in Asia Minor and later cultivated in Europe, the damson is very similar to the common garden plum, *P. domestica*, although the tree is itself somewhat smaller and more compact with smaller leaves, and the fruit is smaller and more oval in shape and has a spicier flavor than that of the common plum. The damson often grows wild in places where the plum was once cultivated.

DAN, dān, the 5th son of Jacob and Bilhah, the maid of Rachel, and founder of one of the 12 tribes of Israel. The tribe of Dan was one of the smallest tribes and was originally given the territory near the seacoast bounded on the east by Benjamin, on the north by Ephraim, and on the south by Judah. Later under pressure from the Philistines of the area, the tribe migrated far northward to the town of Laish, which was renamed Dan. The Biblical hero Samson was a member of the tribe of Dan.

DAN, settlement, Israel, located in Upper Galilee near the border of Syria about 20 miles northeast of Safad. In the modern settlement, which was founded in 1939, agriculture and shoe manufacturing are carried on. To the north at the mound of Tell el Qadi is the site of the ancient Biblical town of Dan, the northernmost point of Palestine (hence the saying "from Dan even unto Beersheba" to denote inclusiveness). Originally the town was called Laish or Leshem until it was taken over by the tribe of Dan. Remains from the 17th century B.C. have been discovered. Pop. (1948) 340.

DANA, dā'nā Charles Anderson, American journalist: b. Hinsdale, N. H., Aug. 8, 1819; d. Glen Cove, N. Y., Oct. 17, 1897. As a youth

he taught himself Latin and Greek and read widely in the classics before he entered Harvard in 1839. With the temporary failure of his eyesight in his junior year, he joined the Brook Farm Community in Roxbury, Mass., where he began his journalistic career as a contributor to the *Harbinger*. In 1846 he was assistant editor of the *Boston Daily Chronotype* for a short time; and from 1847 until March 1862 he was city editor of the *New York Tribune* under Horace Greeley, who finally dismissed him during the Civil War for his aggressive endorsement of the military policy Greeley opposed. He thereupon entered the service of the United States government and was assistant secretary of war from 1863 to 1865. He returned to journalism in the following year, and after editing the unsuccessful *Chicago Republican* for about a year, he purchased an interest in the *New York Sun* (1868), of which he was editor and chief proprietor until his death.

Usually a supporter of liberal causes, Dana nevertheless opposed labor unions and attacked the civil service in Cleveland's administration. As editor of the *Sun*, he made far-reaching innovations in newspaper publishing by introducing eye-catching headlines and developing a style calculated to bring out the so-called "human interest" of the news. He projected and edited Appleton's *New American Cyclopaedia* (16 vols., 1858-1863) with George Ripley, and was the editor of the *Houshold Book of Poetry* (1857). Among his writings are *Life of Ulysses S. Grant* (1868); *The Art of Newspaper Making* (1895); *Lincoln and His Cabinet* (1896); and *Recollections of the Civil War* (1898).

DANA, Francis, American jurist: b. Charlestown, Mass., June 13, 1743; d. Cambridge, Mass., April 25, 1811. A son of Richard Dana (q.v.), he was graduated from Harvard in 1762 and admitted to the bar in 1767. He undertook a special mission to Europe in 1774 to investigate the true state of English relations with the colonies and returned home in 1776, convinced of the need for American independence. The same year he was elected a member of the Continental Congress, and during the Revolutionary War filled various government positions. He served as secretary to John Quincy Adams in France (1780) and, as an American diplomatic representative in Russia (1781-1783), attempted unsuccessfully to gain Russian recognition of his new government. After his return to America, he was again elected to Congress and then served on the Massachusetts Supreme Court as associate chief justice from 1785 to 1791 and as chief justice from 1791 to 1806. One of his sons was Richard Henry Dana; a daughter married Washington Allston.

DANA, James Dwight, American geologist and zoologist: b. Utica, N. Y., Feb. 12, 1813; d. New Haven, Conn., April 14, 1895. He showed an interest in science from his early youth, and in 1830 matriculated at Yale, where he studied under the elder Benjamin Silliman. After devoting three years to the study of mathematics, the classics, and natural science, he received an appointment as instructor in mathematics to midshipmen of the United States Navy, and while cruising the Mediterranean on the ship *Delaware*, wrote his first scientific paper, a description of the volcano Vesuvius. From 1836 to 1838 he assisted Professor Silliman in his chemical labo-

ratory at Yale, and there wrote his first important work, *The System of Mineralogy* (1837).

From 1838 to 1842 Dana was mineralogist and geologist to the United States expedition sent out under Capt. Charles Wilkes to investigate the Pacific Ocean and its natural history, and he subsequently worked up the material which he had collected into many scientific articles. In New Haven in 1844, he married Henrietta Frances, the daughter of Professor Silliman. When the latter resigned in 1849, Dana was appointed professor of natural history (later called geology and mineralogy) at Yale and held the position until his retirement in 1892.

In 1840 he had become editor of the *American Journal of Science and Arts*, to which he contributed many articles. From 1859 his work was seriously hampered by repeated illnesses.

Dana had a keen, analytic, imaginative mind and made valuable speculations concerning the formation of continents, mountains, volcanoes, and other major features of the earth's crust. A member of many of the great learned societies of the world, he was president of the American Association for the Advancement of Science in 1854 and of the Geological Society of America in 1890. He received the Wollaston Medal of the Geological Society of London in 1872 and the Copley Medal of the Royal Society of London in 1877. Among the most important of his numerous writings are the reports from the Wilkes Expedition on *Zoophytes* (1846), *Geology* (1849), and *Crustacea* (1852-1854); and his *Manual of Mineralogy* (1848); *Manual of Geology* (1862); *Corals and Coral Islands* (1872); and *Characteristics of Volcanoes* (1890).

His son EDWARD SALISBURY DANA (b. New Haven, Conn., Nov. 16, 1849; d. there, June 16, 1935), was a well-known mineralogist who studied and then taught physics at Yale. He was the author of *A Text-book of Mineralogy* (1877) and *A Text Book of Elementary Mechanics* (1881); editor of the 6th edition—essentially a new version—of his father's famous *System of Mineralogy* (1892).

DANA, John Cotton, American librarian: b. Woodstock, Vt., Aug. 19, 1856; d. New York, N. Y., July 21, 1929. A cousin of James Dwight Dana, he graduated from Dartmouth College in 1878 but did not become a librarian until 11 years afterward. He first studied law in Woodstock, Vt., (1878-1880), but because of ill health, left for Colorado, where he worked as a civil engineer, then practiced law in New York for three years before returning to Colorado. After a variety of experiences, he was appointed librarian of the Denver Public Library in 1889, without having received any previous training. From 1898 to 1902 he was librarian of the City Library of Springfield, Mass., and thereafter of the Public Library in Newark, N. J. As director of the Newark Museum from its foundation in 1909, he was influential in promoting public interest in industrial arts.

A pioneer in stimulating public use of library resources, Dana was an early advocate of open shelves for public libraries and did much to advance the standards of library service to the public. In Denver he founded the first special library department for children, and in Newark he established the first branch library in the United States devoted to business. He was the first president of the Special Libraries Associa-

tion. Chief among his many publications in the library field were his *Library Primer* (1899) and *Libraries: Addresses and Essays* (1916).

DANA, Richard, American jurist: b. Cambridge, Mass., June 26, 1700; d. Boston, Mass., May 17, 1772. He was a grandson of Richard Dana, who came from England and settled at Cambridge in 1640. After graduating from Harvard and practicing law at Marblehead and Charlestown, he moved to Boston where he became a prominent barrister. From 1763 to 1772 he was a leading figure, and sometimes chairman, of the Boston town meetings. A member of the Sons of Liberty, at their celebrated meeting of Dec. 17, 1765, he administered to Secretary Andrew Oliver the oath pledging him not to enforce the Stamp Act. In 1770 he was a member of the committee which investigated the Boston Massacre.

DANA, Richard Henry, American author and lawyer: b. Cambridge, Mass., Nov. 15, 1787; d. Boston, Feb. 2, 1879. The son of Francis Dana (q.v.), he was admitted to the Boston bar in 1811, but subsequently, except for a term in the Massachusetts legislature, devoted himself exclusively to literature. His earliest writings appeared in the *North American Review*, of which he became joint editor in 1818. In 1821 he edited the periodical *The Idle Man*, in which appeared his two novels, *Paul Fenton* and *Tom Thornton*. His most noteworthy public appearances were a series of lectures on Shakespeare in 1839-1840. His writing style was characterized by a simplicity, vigor, and directness unusual in that epoch. His poems, which appeared in many contemporary publications, were collected in *The Buccaneer and Other Poems* (1827) and *Poems and Prose Writings* (1833; 1850).

DANA, Richard Henry, American author, lawyer, and sailor: b. Cambridge, Mass., Aug. 1, 1815; d. Rome, Italy, Jan. 6, 1882. A son of Richard Henry Dana (1787-1879), he entered Harvard College in 1831, but was compelled on account of poor eyesight to suspend his studies in 1834, in which year he shipped as a common sailor in the brig *Pilgrim*, bound on a voyage around Cape Horn to California. This voyage he described in the book *Two Years Before the Mast* (q.v.; 1840), which has become a classic in American literature of the sea. Returning to Boston on the ship *Alert*, he completed his education, was admitted to the bar in 1840, and soon secured a large number of admiralty cases. In 1841 he published a handbook on seamanship, *The Seaman's Friend* (republished in England as *The Seaman's Manual*), containing a treatise on practical seamanship, a dictionary of sea terms, and information on maritime law.

One of the founders of the Free-Soil Party, Dana participated in its campaigns and later in those of the new Republican Party. He was active in the antislavery movement and in 1853 was a leading figure in the convention which revised the Massachusetts constitution. An inveterate traveler, he published *To Cuba and Back* in 1859, and in 1859-1860 made a world tour, visiting the Sandwich Islands, China, Japan, Ceylon, India, and Egypt, and returning via Europe.

He held public office as United States attorney for Massachusetts (1861-1866), and counsel for

the United States in the proceedings against Jefferson Davis for treason in 1867-1868. He was defeated as a candidate for Congress in 1868, and the Senate refused to confirm him as minister to England on his nomination by President Grant in 1876. He devoted his later years to the study of international law, but, although he published a copiously annotated edition of Henry Wheaton's *Elements of International Law* in 1866, his own projected work on the subject was cut short by his death during a trip to Europe.

Consult Adams, Charles Francis, *Richard Henry Dana* 4 *Biography*, 2 vols. (Boston 1890).

DANA, Richard Henry, American lawyer: b. Cambridge, Mass., Jan. 3, 1851; d. there, Dec. 16, 1931. He was the son of the author of *Two Years Before the Mast*, to which he added an introduction and a concluding chapter in 1911. Graduated from Harvard Law School in 1877, he became a Boston lawyer and organized the Associated Charities of Boston in 1878-1879. His activities on behalf of social and municipal reform included the drafting of the Civil Service Reform Act of Massachusetts (1884) and the Australian Ballot Act (1888), editing the *Civil Service Record* (1889-1892); and acting as chairman (1905-1912) and then president (1913-1923) of the National Civil Service Reform League. He lectured widely on social problems and was the author of several books dealing with reform legislation.

DANA, Samuel Luther, American chemist: b. Amherst, N. H., July 11, 1795; d. Lowell, Mass., March 11, 1868. After graduating from Harvard College in 1813, he served in the army and then studied medicine (M.D. 1818), which he practiced in Waltham, Mass. In 1826 he gave up medicine for industrial chemistry to which he made important contributions. He began to manufacture bleaching substances in Waltham for the Massachusetts cotton industry and soon merged his interests with those of the Newton Chemical Company of which he was the superintendent and chemist until 1833, when he became the chemist at the Merrimac Print Works, Lowell, Mass.

Dana created what is known as the "American system of bleaching," and made improvements in calico printing by extracting the necessary sodium phosphate from bones instead of from animal excrement. He also wrote two books on agricultural chemistry: *A Muck Manual for Farmers* (1842) and *An Essay on Manures* (1850).

DANA, William Parsons Winchester, American marine artist: b. Boston, Mass., Feb. 18, 1833; d. London, England, April 8, 1927. After studying in Paris at the École des Beaux Arts and under Le Poittevin (Edmond Poidevin), he maintained a studio in New York City from 1862 to 1870 and thereafter lived abroad, mostly in London. He was elected to the National Academy of Design in 1863 and was awarded medals at the Paris exhibition of 1878 and a first prize by the Pennsylvania Academy of Fine Arts in 1881. He is best known for his pictures of the sea and ships, for which he had a genuine feeling. His paintings include *Gathering Seaweed*; *Ebbtide at Yport*; *Burning Wreck*; *Chase of the Frigate Constitution*; and *Heartscase*.

DANAE, dān'ā-ē, in Greek mythology, daughter of Acrisius, king of Argos. When she gave

birth to a son by Zeus, who had visited her in the form of a golden shower, Danaë's father put her and her child to sea in a chest. The waves bore them safely to the island of Seriphus, where both were given haven and her son was educated under the name of Perseus (q.v.).

DANAIDAE, dā-nā'ī-dē, a family of butterflies, widely scattered over the world. *Danaus mnippe* (or *archippus*), sometimes referred to as *Anosia plexippus* in old texts, is the monarch butterfly, prevalent in all parts of the United States wherever its favorite food, the milkweed, grows. Its wings are brightly colored, with yellow, black, and white bands. The chrysalis is green and gold, and the caterpillar is marked with yellow and black bands. Other species are found in South America (*Danaus chrysippus*) and as far afield as Australia.

DANAKIL, dān'ā-kīl, desert region, Ethiopia, Eritrea, and French Somaliland. It lies between the gulfs of Zula and Tadjoura and is bordered by the Red Sea on the north and east and the Great Rift Valley on the south and west. A series of mountain ranges parallel to the Red Sea coast include some active and extinct volcanoes which reach a height of 6,500 feet. Numerous salt lakes lie in the lowlands between these ranges and the Ethiopian highlands. The rivers watering the section are the Awash, Ererti, and the Golima. The area is inhabited by the Dankali or Afars who tend animals. Salt and potash are produced.

DANAO, dā-nā'ā, municipality, Republic of the Philippine Islands, on the east coast of the island of Cebu, four miles north of Compostela and 17 miles north-northeast of the town of Cebu. The area is agricultural, producing corn and coconuts, and nearby are coal mines. The productions of the interior are important exports, but the anchorage at Danao is not good enough to encourage steamers to load there. The road along the coast is in good condition. Pop. (1939) 28,387; (1948) 26,461.

DANAUS, in Greek mythology, the son of Belus and twin brother of Aegyptus, originally ruler of Libya. Fearing his brother, he fled to Argos with his 50 daughters, the Danaides, and here he was chosen king, in place of Gelanor. The 50 sons of Aegyptus followed him, and under the pretense of friendship sought the hands of his daughters in marriage. Danaus consented, but on the bridal night he gave his daughters each a dagger, and urged them to murder their bridegrooms in revenge for the treatment he had received from Aegyptus. All did so, except one, Hypermnestra, who allowed her husband, Lynceus, to escape. The fable, from this point, has three alternate conclusions: (1) in the underworld the Danaides were compelled to pour water forever into a vessel full of holes, as a punishment for their crimes; (2) Lynceus returned and killed Danaus and his daughters, except Hypermnestra, and became king; or (3) the daughters were purified by Athena and Hermes after burying the heads of their husbands in Lerna and their bodies outside the city.

DANBURY, dān'bēr-ī or dānbēr-ī, city, Connecticut, in Fairfield County; altitude 375 feet; served by the New York, New Haven, and Hart-

ford Railroad. It is situated in the foothills of the Berkshires, in a region of dairy, poultry, and truck farms. One of the nation's leading hat manufacturing centers, the majority of Danbury's mills and factories are engaged in some branch of the hat industry, producing straw, wool, and felt hats, fur felt, silk ribbons and bands, hatters fur, and hat-making machinery. The manufacture of hats has dominated the economic life of the city since 1780, when the first beaver-hat factory in America was established here. The steady development of the industry, however, has not excluded other commercial interests. There are also important manufactures of silver and metal goods, ball and roller bearings, heating units, airplane parts, aluminum foil, surgical instruments, cardboard and fiber boxes, undergarments, men's shirts, and broad silks.

The city is the seat of Danbury State Teachers College, coeducational, founded in 1904; college library facilities supplement those of the Danbury Library, among whose collections is a complete file of the *Danbury News*, established in 1865.

Annually the city is the scene of the Danbury Fair, held in the fall; exhibitors throughout the East bring the best their farms and estates produce—prize cattle, poultry, and flowers. Fairs have been held here since 1821; the present fairgrounds have been in use since the early 1870's.

Points of interest within the city are several old buildings representative of 17th and 18th century architecture. Among them is the Asa Hodge House (c.1695), reputed to be the oldest dwelling in Danbury; the Isaac Ives Home (1780), a gambrel-roofed building with a unique strap-hinged door; the Hoyt House (1750-1760), which served as a hospital during the American Revolution; the Cooke House (1770), visited at one time by Washington, Lafayette, and Rochambeau, and partially burned during the British raid in 1777; and the Old Brookfield Inn, a red, salt-box structure (late 17th century). Nearby Bethel, once a part of Danbury, was the birthplace of Phineas T. Barnum, showman, and Julius H. Seelye, a president of Amherst College. Within easy driving distance of the city is Wooster Mountain State Park; to the southeast, the Israel Putnam Memorial Camp Grounds, sometimes called Connecticut's "Valley Forge." Here Putnam's troops, the right wing of the Continental Army, camped during the winter of 1778-1779. North of Danbury is Lake Candlewood, largest lake in the state, and popular resort region.

Danbury was founded in 1684 as Pahquioque by settlers from Norwalk, and later renamed. At the outbreak of the Revolution, the town was an important depot for military supplies, and as such, was the object of a raid by the British in 1777. It was during this raid that Gen. David Wooster, commander of the Danbury forces, was killed; Danbury's Wooster Square and Wooster Cemetery were named in his honor. The town was incorporated as a borough in 1822, and was granted its city charter in 1889. The community of Danbury comprises a dual government, the city and the township. Pop. (1940) 22,339; (1950) 22,067.

DANCE. The activity of dance is older than man himself; the art of dance, immeasurably ancient. The former represents the instinctive channeling of energy into rhythmic form while the



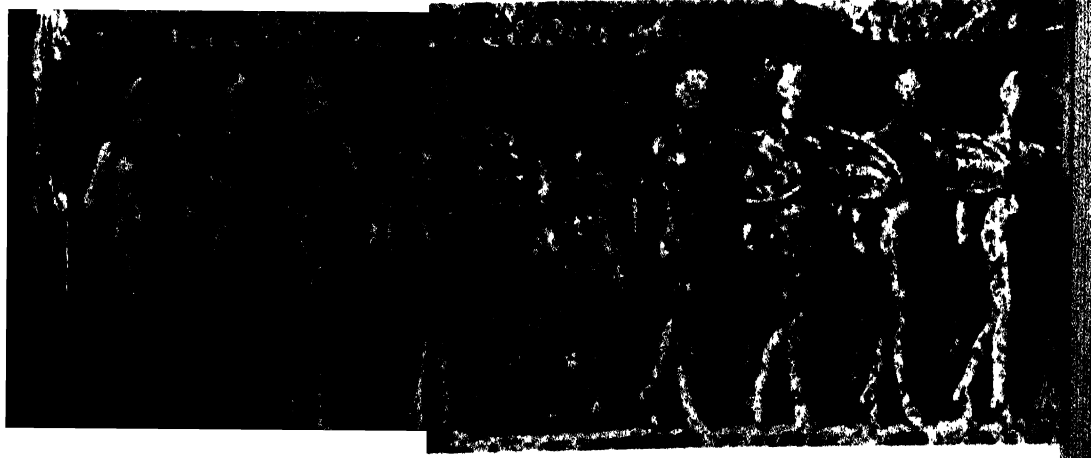
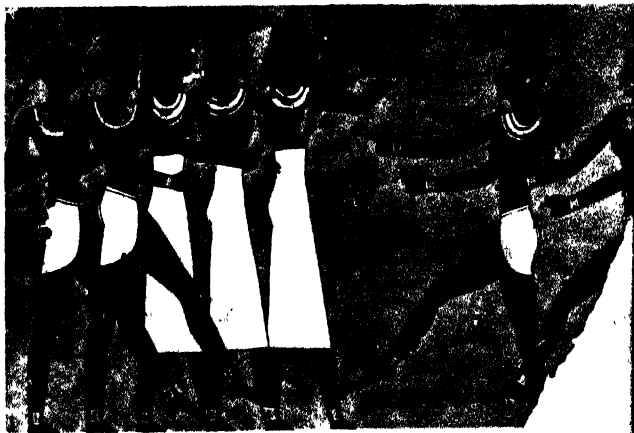
Above: "L'après-midi d'un faune," as presented by Sergei Diaghilev's Ballet Russe on American tour, 1916-1917.

DANCE

Right: About 4,000 years old, the Egyptian wall painting from Thebes shows dancing girls.

Below: Athenian monument shows "pyrrhic dance" used by ancient Greeks for training soldiers.

(Above) Metropolitan Ballet Company by Morris Gest; (right) Metropolitan Museum of Art; (below) Acropolis Museum





Above right: Breaking with formal tradition, Isadora Duncan revived spontaneous expression in the dance.

Above left: Several American Indian tribes dance with hoops, like these Navajos.

Left: Ancient dance still performed at the "Great Fiesta of the Indian" in Amancaes, near Lima, Peru.

Bottom left: Ruth St. Denis used lore of the Orient.

Bottom center: Ted Shawn invokes the thunder bird.

Bottom right: Classic Russian ballet—Diaghilev's "Schéhérazade."

(Above right and bottom left) Brown Brothers, (above left) Santa Fe System Lines, (left) Grace Line Photo; (bottom center) Wide World Photo; (bottom right) Metropolitan Ballet Company by Morris Gest



latter suggests planning by experts for channeling energy into a rhythmic form which will have meaning to the beholder as well as to the doer.

There is a tendency in our time, and in America particularly, to view the flourishing art of dancing as something fairly new. Actually, it is, in spite of tremendously important innovations, a dance renaissance, for although the art of dancing was treated rather like a forlorn stepchild until recent years, the scholar never forgot that dance was, in many respects, the mother of the arts. With life came movement, and with movement the essential ingredient of dance came into being.

Havelock Ellis, Curt Sachs, and others have written of the dance of beasts and birds, mating dances which boast recognizable rhythms and choreographic disciplines, dances which can be compared, in certain instances, with dance forms invented by humans. Children, even babies, are natural dancers. Before he can walk (although often thought of as a matter of steps, dancing is not limited to the feet), the baby waves his arms rhythmically. Not many years pass before he hops up and down with excitement, ranges rhythmically in his first tantrum, responds in dance to the music of the radio, or emulates the adult dancing images on television.

Primitive Origins.—Early man was, undoubtedly, rather like a child in his dance ways. He "danced out" his feelings and quite possibly he achieved his best method of communication with his fellows through dancing. Surely, he had a dance of prowess with which to attract the female, and certainly he had some form of gestural dance by which he reported the triumph of battle, the success or failure of the hunt, the questions which stirred an awakening mind. Admittedly, one can only guess at the way early man danced, but the next step in his dance progress is so clear that the guessed preliminaries seem accurate.

For once man had communicated with his own kind, he commenced to seek communication with powers greater than himself. He tried to make contact with the mysteries of nature through the mysteries of dancing. The inexplicable swaying of trees, forced into motion by the unseen force of an unseen wind; the rushing of rivulets or the pound of surf; lightning, thunder, heat from the sun, the dark blanket of night, these were but a few of those mysteries of nature which primitive man could not explain and so he treated them with respect, emulating their marvels in the movements, the gestures and, finally, the ceremonies of his dance.

In time, he came to worship not the thing itself—not lightning, nor trees, nor waters—but the powers, the spirits which inhabited them. Thus his dance scale began to extend beyond the forms of imitation and commenced to exploit that area of dance which treats with symbols. To him, dance was not a luxury; it was, indeed, a necessity, for dance was the physical manifestation of his religion and his religion required that he attempt to control, through magic and mysteries, those forces over which he had no actual control. Dancing was his way of speaking to the gods.

He danced in celebration of birth, of adolescence, of marriage, of death. He danced to bring fertility to crops, to flocks, to his family and tribe. He did battle dances, sometimes to build

his own bravado and often to predetermine the outcome of the battle upon which he and his fellows were about to embark. He, and many thousands of his present-day descendants had not only dances such as these but also dances to bring on rain or to bring out the sun, to supplicate the gods or even to tease them, to cure sickness or to suggest disaster for the enemy. Dancing was, and remains for many, an integral part of life itself.

In summation, it may be said that primitive man—yesterday and today—found his reasons for dancing in religion or magic, in his own physical energy, in sexual drives, and in the need to communicate. And modern man, if he pauses for analysis, will find that these ancient sources provide the stimuli for all of his dances, folk or theatrical, to this day.

Historical Beginnings.—As man moved from the comparative simplicity of tribal life into social systems involving federation or the building of a nation, his dances increased in complexity. The conqueror and the conquered mingled not only their blood strains but their ideas and their customs. As religious forms grew in scope and in power, so did the dance forms essential to ritual. And once dance ritual became so elaborate that trained experts were needed to carry out its measures, the art of performing was born. The priests danced, the worshipers watched. Total dance participation, of course, continued in certain instances but with the celebrants divided between the doers and the beholders, the coming of theatrical dance, of dance as an art form, was omened.

Among the ancient peoples noted for their dance were the Egyptians. The people danced, the priests danced, and there were professional dancers to entertain the royal and the rich. Wall paintings on the tombs report the range of ancient Egypt's dance interests. And the great astral ballets, mirroring in human choreography the rhythm of the universe, although presumably an activity of antiquity, still live today in Egypt, where the celebrants of quite another faith, the dervishes, occasionally recreate the whirling patterns of the heavens in their rites.

In classical Greece, there were, of course, dances for religious events but there were also dances for the training of soldiers (pyrrhic), for the telling of myths and fables, for inclusion in spectacles, for the participation of the folk. And from the dithyramb, that choral song and dance dedicated to Dionysus, the great Greek theater was born.

Egyptians and Greeks, Sumerians and Hittites, Mayans and Incans, Etruscans and Romans and, in truth, all peoples of earlier civilizations than ours contributed their patterns to the lore of dancing. Some left tangible records, paintings, or statuary which gave a fragment of permanence to a fragment of dance, while others bequeathed their own dance heritages and discoveries to a living stream of descendants.

In India, more than a thousand years ago, the rules of India's classical dance, divinely inspired, were set down. Then, as today, Siva, one of the Hindu Trimurti, was recognized as Nataraja, lord of the dance. With such divine inspiration, it was hardly surprising that India should give to the world one of the greatest dance art forms of all time. It was and is now represented by four major schools—Bharata Natyam, Kathakali, Kathak, Manipuri—a serene, though

technically complex and highly demanding, way of dance, particularly when compared with the dance of the West which partakes of that overt ecstasy symbolized (in the religious dance area) by David's dance before the ark.

But although the influences of Oriental dance and the dance of India especially are now being felt in the Western world, the great course of Western dance art streamed mainly from Egypt, through Greece, to Rome, and thence down the centuries to us. Rome's dance, aside from some indigenous material and Etruscan influences, was mainly a continuing of Greek forms. The Roman theater, though not as vital, was basically the same. But as the empire grew and peoples were moved about, folk forms and special dance prowesses of the captured nations were introduced into Roman entertainments. And among the introductions or discoveries or inventions during Roman days was the art of pantomime, a form of theater which contributed enormously to or, perhaps, actually grew into the ballet.

There was, however, to be a gap in the development of theater dance, for with the crumbling of Rome and the rise of Christianity there would be little in the way of an art dance until midway in the Renaissance. Although the early church did not, except in certain instances, forbid dancing, the heritage of pagan dance ritual could be dangerously strong in the hearts and bodies of new and, perhaps, not quite certain converts.

In a great many churches, dance was incorporated into Christian services and these remained—some to this day. But the potential peril of pagan memories, the licentiousness of Roman theatrical dancing, and secular influences invading church dance caused the church fathers to revoke church dance rights—just as secular influences forced Biblical dramatizations out of the church—first here, then there, and finally in most of the churches of Western Europe.

Dancing, of course, survived in the churches which permitted the continuation of dance ceremony, in the festivals—part pagan, part Christian—of the village folk, in those folk dances which found their way into castles and palaces and, most of all, in man's unquenchable instinct to dance.

Rise of Ballet.—With the Renaissance came rediscovery and new creativeness; it was, therefore, inevitable that dance should experience rebirth. This time it would be the ritual of etiquette, rather than the ritual of religion, which would guide its course. Courtly behavior—the bow (to king, not deity), the graceful walk, the new and, perhaps, superficial elegance in deportment—colored the measures of dance which the court had borrowed from the peasant and subjected to refining influences. Court dances, however, were not art dances. Something had to be added.

Three years before Columbus set sail for America, a banquet fete was held in Milan and this event is generally viewed as the prelude to ballet. Certainly it was a theatrical affair, for dancing, singing, mining, and orating were all combined in a spectacle given in honor of a wedding involving nobility. The performers (amateurs, to be sure) performed and the non-performers watched. Here was theater and a major portion of it was dance.

A century later, in 1581, the queen mother of France, Catherine de' Medici, entertained a vast audience of nobles and royalty with the first so-

called ballet, *Le Ballet Comique de La Reine*, which, if it included song, poetry, acting, and declamation as well as dance, nevertheless boasted a choreographer, Balthazar de Beaujoyeux (real name, Baltazarini). Shortly thereafter, *Orchesographie* by Thoinot Arbeau (real name, Jehan Tabourot) was published as a guide to the dance forms and technique of the day.

Louis XIV, a dancer himself, founded, in 1661, the Royal Academy of Music and the Dance; the first known professional ballerina, Mlle. Lafontaine, made her debut in Paris in 1681 and, during the next hundred years, such illustrious dance names as Marie Camargo, Marie Sallé, Jean Georges Noverre, and Gaetano and Auguste Vestris (father and son) found immortality. Technique expanded, choreographic concepts developed and dancing, once more, became a major art.

In the early 19th century, the ballerina rose upon her toes, thus ushering in a whole new era of dance, new in technical range, new in style, new in subject matter. Maria Taglioni, Fanny Elssler, Lucile Grähn, Carlotta Grisi, Fanny Cerrito, were idolized; *Giselle*, still a favorite with contemporary audiences, was created; ballet enjoyed popular successes and artistic nurturings in France, Italy, England, Scandinavia, Central Europe, Russia, and even in America.

Rebellion, however, was imminent. *The Sleeping Beauty*, *Swan Lake* and *The Nutcracker* had been created in the late 19th century and were destined to remain, aside from a few ups and downs, perennial favorites, but the format and even the movement ingredients of these and similarly constructed works disturbed some fresh creative minds. Michel Fokine (1880-1942) worked his revolution within the framework of ballet. Isadora Duncan (1878-1927) and Ruth St. Denis did not.

Isadora Duncan.—During the first quarter of the 20th century, the ballet, both traditional and modernized, continued to expand through the efforts of Sergei Diaghilev and the company he brought out of Russia to the West; through Anna Pavlova, Vaslav Nijinsky, Tamara Karsavina, Fokine, Léonide Massine, George Balanchine, and many others. But a new way of dance had come into being. Or, perhaps, it was a return to ancient dance principles and the application of such principles to a new age.

Duncan, turning to classical Greece for her inspiration, was not attempting to revive an antique dance but to restore to contemporary dance the vital spirit which had characterized the dancing of ancient Greece. She rejected the ballet, unlike Fokine whose balletic reforms she had influenced, and built a free form of dance based upon the natural movements of man and with the center of action placed in the solar plexus where she believed the soul was housed. By using the solar plexus as the center from which all kinds of movement emanated, she was able to increase enormously the emotional power of dance in addition to giving it a movement area which the classical ballet, so concerned with the action of the body's extremities, tended to neglect. Musically, she refused to use the kind of doggerel which afflicted all too many ballet compositions and, by employing the music of the great masters for her creations, she sought not only personal inspiration but also equality for the art she represented.

Her celebration of the potential perfection and



DANCE

Above left: Drums and bongos syncopate for Afro-Cuban dance in New York night club. *Above right:* Formal Siamese dance graces Rodgers and Hammerstein's "The King and I" on Broadway. *Below:* Indigenous American style from Hollywood.

(Above right) by Bob Golby, (below) RKO Radio Pictures, Inc.





(Above) George Roger-Magnum; (below) Ballet Russe de Monte Carlo

Above left: Vivacious rendition of "legong," dance pantomime based on episodes from the "Ramayana," in the village of Midjil, Bali. **Above right:** Rice farmers of Ubud, Bali, perform the complicated and warlike "pandjak."

Below: "Coppélia," once marked trend in ballet toward humor and characterization.



beauty of the human body; her selection of themes which had nothing to do with enchanted creatures or fairytale princesses but with human passions and ideals; her cherishing of the natural, the free, the impulsive; her explorations of the nature of movement with respect to the nature of man, these were her immense contributions to the art of dance aside from the unmatched impact of her performing genius. Upon her passing, she left no repertory that could be danced with anything like the same success by others. Her methods of training survived her with little and constantly narrowing effectiveness. But her concepts endured and worked and continue to work a powerful and still needed influence upon the art of dancing.

Ruth St. Denis and Ted Shawn.—Isadora Duncan's contemporary, Ruth St. Denis, turned for her inspiration to the Orient, to cultures which gave prominence to the spiritual element in dance, and which danced their religious faiths. Like Isadora Duncan, St. Denis was mainly self-taught. She had received some instruction in the principles of the great French scientist of movement, François Delsarte, but this, her sketchy training in ballet, and her many successful experiences as a "hooper," "high kicker," "trickster," were of little use to her in the way of dance which she founded.

Hers also was a free way of movement, with each theme evoking a special movement style and with all dance actions governed by the demands, in a given dance, of race, character, and dramatic situation. With her debut as a concert dancer in New York in 1906 with a program featuring her Oriental ballet *Radha*, a new era in American dance was born.

Although Ruth St. Denis gained worldwide renown, she, unlike Isadora Duncan who passed the greater part of her life in Europe, made America her headquarters. She was already a great star, an innovator whose influences in dance and in the theater were enormous, when she met and married Ted Shawn, an ex-divinity student who had commenced to make a name for himself as a dancer, teacher, and pioneer in new forms of dance. During their long career together, as heads of the famed Denishawn Dancers, they toured constantly throughout the United States, bringing richly staged productions to cities, towns, and villages; traveled abroad, both in Europe and in the Orient, and founded Denishawn schools in key cities of the United States.

Oriental, ballet, primitive, and ethnic dance techniques and freshly originated movement techniques were all a part of their broad method of dance training and dance performing. Miss St. Denis, in addition to her continuing work in the field of Eastern religious dance, experimented with music visualizations, and began her historic work in creating a liturgy of Christian dance.

Shawn, naturally concerned with dancing for men, spent much of his creative energy in evolving non-balletic dance techniques for men and, after his separation from St. Denis, inaugurated in 1933 the highly successful seven-year period of his all-male company of dancers. In addition to his immeasurably important contributions to dancing for men, he was one of the first Americans to use the compositions of modern composers for his dances—commissioning scores especially for the Denishawn company productions—and to stress American thematic material in dance.

Modern Dances.—From the Denishawn school came a new group of dancers who were to call themselves, for want of a better name, modern dancers. Rebelling against what they felt were the eclecticism and exoticism of Denishawn, were three of the company's brightest junior stars, Martha Graham, who started on her own in the mid-1920's, and Doris Humphrey and Charles Weidman, who left Denishawn a few years later. These three, together with Helen Tamiris, Hanya Holm (who had come from Germany), and others launched the modern dance.

Each was determined to evolve a way of dance which owed nothing to balletic or ethnic dance techniques, which did not depend upon elaborate staging for theatrical effect, which refused the support of familiar music, which shied away from literary themes. The whole movement was a striving to rediscover the purity of dance. The anatomy was studied, the potentialities and limitations of the body in movement were explored, and the relationship of motion and emotion was, in a manner which would have earned the approval of Delsarte, profoundly investigated.

Miss Humphrey was particularly concerned with the principle of fall and recovery with respect to movement range and a comparable dramatic and even philosophical range. Graham's fundamental was, with respect to technique, the principle of contraction and release, and this principle was applicable not only to outer muscles and visceral muscles, but also to emotional shifts. Weidman dealt with kinetic pantomime as opposed to purely representational mime. Tamiris experimented with motor responses to jazz, with self-accompaniment. And from Germany, Holm brought the technical principle of tension and relaxation, and the dynamic range of action lying between the two extremes of energy-expenditures. Other discoveries, rediscoveries, and technical developments rounded out these artists' contributions to a new dance way.

At first, the modern dancers secured for themselves only a small, but ardent, following. To many, their works seemed "ugly" (the favorite description) and obscure. But as the new techniques grew, hitherto barred elements of theater were reintroduced and a striking repertory of modern dance was created. And if modern dance did not win for itself a public as great as that for ballet or other more familiar forms of theatrical dancing, it did win respect, and it became the paramount technique in the mushrooming field of educational dance.

Meanwhile, Europe had evolved, and slightly earlier than America, its own modern dance, particularly under the guidance of Rudolf von Laban and his great pupil, Mary Wigman. There were, at first, few exchanges between the modern dancers of America and those of Central Europe, and the two modern dance eras were, in effect, launched independently.

Just as Isadora Duncan influenced Fokine and the ballet at the turn of the century, and St. Denis brought her special contributions to the American theater, so modern dance, both at home and abroad, began to make its fresh powers felt in ballet. From the late 1930's, ballets created by Anthony Tudor, Agnes de Mille, Jerome Robbins, Eugene Loring, and others, reflected the potent effect that modern dance had had upon all dance movement, ballet especially.

Midway in the 20th century, dance was enjoying its own renaissance. Ballet in Europe, and

in England in particular, entered a new age of creativeness and of popular appeal, and in France, the works of young and experimental choreographers gave French ballet new prestige. Although America has always had some form of ballet experience since the days of George Washington—and even produced some native ballerinas more than a century ago—the periods of balletic interest and activity were sporadic until 1933 when the Ballet Russe de Monte Carlo inaugurated a still-functioning surge of ballet productivity and popularity in America, a surge propelled by The Ballet Theatre, the New York City Ballet, and other institutions.

Modern dance, represented in the 1950's by its founders, and with especial brilliance by Martha Graham as dancer and choreographer and by Doris Humphrey as artistic director and chief choreographer for José Limón and his company, produced new generations of creators and performers. Several worked in the concert field but many were occupied with teaching in studios or in high schools and colleges, with assignments in Broadway musicals and with important functions in movies and in television.

The ethnic dance field also grew tremendously. For ever since La Argentina, Argentinita, Vicente Escudero, and Uday Shan-Kar first brought their nations' dances to America, interest in the dance arts of other peoples swelled to the point where ethnic dancers were to be found on museum and school schedules of cultural events, and in Broadway theaters. And in its turn, ethnic dance generated influences of growing significance to musical comedy as well as to dance.

La Meri, an American specializing in ethnologic dance forms, experimented successfully with the application, say, of Eastern dance techniques to Western subject matter, and modern dancers and choreographers for the lyric theater gave increased accent to ethnic colorings in their choreographies.

In American cities and in New York particularly, the dance follower found not only recitals of Spanish and East Indian dance, but also African, Haitian, Korean, Chinese, Japanese, Balinese, and other ethnic styles presented by experts from these nationalities, or by Americans specializing in such forms. But after World War II exports of American dance began to balance the imports as American dance companies—ballet, modern, ethnic—and American dance soloists carried their special artistry to other lands.

From an art generally neglected by Americans, dance expanded to that point where hundreds of dance events took place in New York each year. Most dancers engaged in national and (sometimes) international tours; the popular theatrical outlets (musical comedy, movies, television) required the presence of dance. The art of dance came to be regarded as a major factor in education, and the therapeutic values of dancing for the physically or emotionally ill or injured were recognized.

In a very real sense, in the America of the mid-1950's, the art and the activity of dance re-emerged as an important human experience, not yet an integral part of life itself as they were in ancient days, but more potent than they had ever been before in America since the white man's culture supplanted that of the dancing Indians.

WALTER TERRY,

Dance Critic, New York Herald Tribune.

DANCE, Ballroom. Social dances of today which culminated in the waltz and fox trot, are descendants of the "dances basses." One of these the minuet, was introduced to Paris in 1650, and flourished under Louis XIV. From that time on, the popularity of the minuet became world wide, and for over 150 years every state ball in every civilized country in Europe opened with a minuet. One of the dances that followed the minuet was the quadrille, a square dance which was introduced into the French ballets about 1745. It became popular sixty years later but it wasn't until 1808 that it was introduced into England. The quadrille paved the way for the great revolution in social dancing—the waltz.

The waltz was a distinct departure from all established forms of the dance in that for practically the first time two people of opposite sex danced with each other and together. It is usual today to trace the waltz back to southern Germany from where it swept over Europe. About 1812 the modern waltz, danced to ¾ time with the male holding his partner around the waist, was introduced in London, arousing a storm of protest against its indecacy. Opposition lasted three years, but when the Emperor Alexander I of Russia and other society leaders were seen dancing the waltz, it was accepted generally.

In contrast to the cool reception given the waltz was the enthusiasm with which the polka was received. The polka, or half-step as it was then called, of Bohemian origin, was introduced in Paris in 1840 and dancers went completely mad over it. The polka was danced publicly in the streets, night and day, and traffic was disorganized. Several years later, it appeared in London and met with quick approval. In this same period appeared in quick succession the mazurka, a Polish dance invented in the 16th century; the schottische, somewhat similar to the polka; the lancers, a square dance of courtly movements introduced to France in 1836 and to England 14 years later; and the barn dance, of American origin. None of these, however, enjoyed the popularity of the waltz or the shorter-lived polka. At the close of the Victorian era ballroom dancing, not only in England but elsewhere in Europe, was inclined to stagnate, apparently because of the absence of new steps. From America were imported the Washington Post and the two-step; the former enjoyed only a brief popularity while the latter was still too academic in form to catch the public's fancy.

Dancing in America, as its folklore, is predominantly English inspired, at least up until the 20th century. English dances were brought over with the settlers and took root as our folk dances, slightly transformed. The Anglo-American folk-dance tradition includes both solo and group forms. Popular solo dances were the clog, the flat-foot, and the shuffle. The traditional group dances fell into two divisions—the country dances for men, women, and children, and the ritual dances for men only. The country dances though originating among the peasants, became the common possession of all classes. Brought to this country by the colonists, the various types survive in numerous forms throughout America. Among them are the square dances and the Virginia reel. Among the ritual dances, such as the morris dance and the sword dance, only fragmentary forms are to be found here. Purely indigenous to America, however, is the barn



DANCE

Above left. Pearl Primus converts African dance into dynamic theater. Above right: Martha Graham conceives dramatic and intense choreography. Below: Moira Shearer yearns for Prince Charming in "Cinderella."

Courtesy (above left) Austin Wilder, (above right) S. Hurok; (below) Sadler's Wells Ballet





Above: The Sleeping Beauty awakens in the Sadler's Wells Ballet.

Left: Catherine Dunham draws inspiration from West Indian folk dances

Courtesy (above) S. Hurok; (left) Carmen Schiavone; (bottom, left and center) Phillip Bloom, (bottom right) Ballet Russe de Monte Carlo Inc.

Bottom left: Maria Tallchief of the New York City Ballet in Marc Chagall's costume for "Firebird," choreographed by George Balanchine to music by Igor Stravinski.

Bottom center: Tanaquill Le Clercq resists and accepts Francisco Moncion in Maurice Ravel's "La Valse."

Bottom right: Alexandra Danilova and Frederic Franklin in traditional ballet costumes.



dance which, though of schottische influence, was first invented to celebrate the completion of the building of a barn, a communal affair then. The Paul Jones is one of the many sets that comprise an evening of barn dancing. America got off to a late start in dancing because, under Puritan rule, dancing was prohibited. It was only later that the waltz, the square dance, and the English folk dances entered through the more liberal settlements of the South. But there was dancing here, among the Indians. The American Indians had a strong racial tendency in their dances which were closely allied to religious sentiments; they were not filled with gaiety, but were stolid and serious. As among other aborigines, the American Indian dances are part of magic rites or are employed to produce some desired favor from the gods. Animal dances are numerous, the best known being the snake dance of the Moquis in Arizona and the beaver dance of the Blackfeet tribe. Other dances are the ghost dance, symbolizing communication with the Great Spirit, and the dream dance, a folk dance of the Chipewewa tribe.

Urban America slavishly copied the waltz, the polka, and mazurka, and the schottische. Elder members of society emerged at rare intervals for traditional assemblies and cotillions and in humbler circles there were the "grand balls." The rise of ragtime and jazz music, popular since the turn of the century, was the springboard for an entire new set of dances typical of a roaring, industrialized country. The dances were frenetic, nervous, and often crude, but, making full use of the new ragtime rhythms, spread like prairie fire. The first dances of the new century were the cakewalk, the turkey trot, the Texas tommy, the bunny hug, and the grizzly bear and these gave birth to a host of imitators, the gotham gabble, the humpback rag, the gaby glide, and others. In essence, the new dances were simple: partners walked a sort of rocking, swooping walk, swaying outward with each step. It epitomized the go-as-you-please style and symbolized the rebellion against the formalized technique of the European dancing master.

Somehow, restaurants began the practice of permitting diners to dance these steps during the course of their meals. It proved to be the one most important achievement in bringing the dance to the masses of people. The dances were so ridiculously easy to learn and were so agreeably un strenuous that they were taken up by young and old. Before World War I, the Castles—Vernon and Irene—went to London looking for work and, quite by chance, became an overnight sensation. On their return to America, they were acclaimed the foremost exponents of the popular dance. The Castles were important in the development of the American dance in that they brought to the awkward and vulgar-looking dance forms a combination of easy gaiety and almost patrician fastidiousness.

Between 1912 and 1915 there occurred what has been called the dance craze, reputedly brought about by the fast-spreading rumors of a European war. Overwhelmed by war bulletins, people with tense nerves sought an escape on the dance floor. During this period, more than 100 new dances were introduced. Dancing started in the afternoon at tea dances and continued through the evening until early morning. Of the constant succession of new steps, the most popular during this time were the hesitation waltz, the Argen-

tine tango, the maxixe, imported from Brazil early in the century, the lame duck, the Castle Walk, and finally, the fox trot, which in 1915 began gradually to push the others into the background and became the standard vogue. An outgrowth of ragtime, the fox trot is typically American in rhythm and is danced in 4/4 time and played in two distinct tempos—slow and fast. Also popular is the one-step, executed in 2/4 time. Faster than the fox trot, it consists mainly of walking forward and back with a square step added occasionally to aid in turning. The Charleston, which had a vogue in 1925, created more of a furore than any dance since the bunny hug. This was followed by the black bottom, which was short-lived. Ballroom dancing was standardized in 1925 when Arthur Murray simplified all modern dancing by formulating five fundamental steps. And five years later he introduced the Westchester style of dancing popular with college students. This called for a sixth basic movement—the running step.

The vogue for swing music, which broke out in 1935, was the occasion for the creation of several new dances just as ragtime and jazz produced the turkey trot, Texas tommy, etc. First of these were the shag and the lindy hop. As the swing vogue spread and jitterbugs—followers of this music—demanded more expressive dances, there were created in 1937 group-participation dances, the first of which was the Big Apple. This was a combination of several jitterbug dances, such as the shag, trucking, pecking, and the Suzy-Q, and made use of a caller, long familiar to square dancers. The Big Apple was followed by Peelin' the Peach.

Among politer dancers, there was a vogue for English importations. In 1938, Arthur Murray introduced the Lambeth Walk and the following year the Chestnut Tree and Booms-a-Daisy, vivacious dances pantomimic in nature. However, since these dances were performed to one particular tune, the decline in popularity of the tune caused a similar fate for the dances. In addition to these, the rumba, introduced into New York from Cuba in 1914, and the conga, also of Cuban origin, are very popular, particularly among dancers in higher economic groups who can afford to patronize the night clubs where the bands which play Cuban rhythms are engaged.

DANCE, Saint Vitus's. See CHOREA.

DANCE MUSIC. So interrelated are dance, music and drama that separation, even for historical purposes, is difficult. The three were used as one in the primitive ritual. Voodoo dance accompaniments were usually either a creeping melody with a range of several neighboring notes or a violent outburst of sound, cascading downward. Both types were repeated endlessly. During the Greek era the dance lost its religious, ritual character and appeared for the first time as entertainment. Remaining musical fragments are few, however, and our ideas concerning continuity of movement vague. The stage went from decline to decadence during the Roman Empire; the popularity of erotic, Oriental dances being partially responsible for the ban placed on dancing when Christianity overwhelmed Rome. Folk dancing and folk music—irrepressible—are the slender threads connecting this period with the Renaissance.

In 1300 a tract by Johannes de Grocheo ap-

peared describing the secular music of the time. Prominently mentioned were the "estampies" and "ductia," dance-songs accompanied by a reed or stringed instrument. Before the publication of such an important source as the *Glogauer Liederbuch*, c.1460, oral transmission had largely been responsible for the perpetuation of dance music.

Church suppression relaxed in the 15th century and secular music began its revival with the ballo (dances accompanied vocally and instrumentally) and the *Canti Carnascialeschi* of Heinrich Isaak (1450?-1517) in which one finds a sustained melodic line and accents carefully placed in a manner suitable for dancing. A forecast of opera and ballet is found in the theatricalized instrumental accompaniments of a spectacle given at the court of Gian Galeazzo Sforza in 1489.

The 16th century witnessed a resurgence of dance activity. Manuscripts show a variety of dances; a twofold, slow + quick, or *pavana-saltarello-piva* arrangement being used. The latter, with new dances which appeared in this century—*allemande*, *courante*, *saraband*, and *gigue*—led to the creation of the standard suite of the following century. During the 17th century ballet left the court and Lully created a type of "danced-action." Three quarters of a century later Rameau reduced these sequences from action-furthering to divertissement-type interludes. Reform in the hands of Jean Georges Noverre (1727-1809) aided by Gluck swept aside the Rameau formula and substituted a grand, heroic style.

In the 19th century there appeared a new kind of ballet suite based on the social dances (waltz, polka, polonaise), then sweeping the continent. A new theatricality is found in ballet music; the hackneyed scores of Ludwig Mincus, Cesare Pugni, and Riccardo Drigo are thrown into relief by the *Swan Lake* of Tchaikovsky and the *Coppélia* of Delibes. This willingness of important composers to create music for the ballet becomes a characteristic phase of the 20th century. Diaghilev was able to interest such composers as Stravinsky, Prokofiev, and Ravel in composing ballet music, thus dispelling the onus associated with writing the same.

Isadora Duncan's use of Wagner, Chopin, and other composers is characteristic and contributive to the other tendency of the century—the use of borrowed music for theatrical dance. In the realm of social dance, jazz, ragtime, and swing were some of the musical styles to which various dances—the bunnyhug, foxtrot, jitterbug—were done.

GENEVIEVE OSWALD JOHNSON,
Music Division, New York Public Library.

DANCE OF DEATH, a grotesque allegorical representation in which the figure of Death under various forms takes the lead, followed by dancers of all ages and conditions. It was frequently drawn by artists and used for literary and theatrical purposes, in some cases as early as the 14th century but most commonly in the 15th and 16th centuries. Great epidemics of disease during these periods were a constant reminder to men of the universality of death, and dramatic treatments of this idea appeared throughout Europe. Such plays warned men that they should be prepared to meet death which could come at any time and to any man.

One of the earliest pictorial representations of the subject was painted about 1425 in Paris

on the walls of the cemetery of the Innocents. The most famous conception was executed by Hans Holbein, the Younger, in a series of drawings. Woodcuts of these were published at Lyon, France, in 1538. In Holbein's work the emphasis is on the encounter of the individual with Death instead of, as in earlier treatments of the subject, the dominion of Death over all mankind.

DANDELION, dăn'dê-li-ŭn (Fr. *dent de lion*, lion's tooth, from the shape of the leaves), or **BLOWBALLS** (*Taraxacum*), is a genus of herbs than 100 species of biennial or perennial herbs of cold or temperate parts of both hemispheres, belonging to the sunflower family (Compositae). Dandelions are characterized by a rosette of basal, nearly entirely or variously pinnatifid leaves, single hollow scape (stalk) bearing a large, solitary, yellow flower head, and oblong-ovate to fusiform fruits (achenes) prolonged into a slender beak topped by a copious soft, pale, capillary pappus. After flowering the whole involucre reflexes and exposes the globular head of fruits to the wind.

Two species are common in the United States, the brown-seeded common dandelion (*T. officinale*) and the less common red-seeded dandelion (*T. erythrospermum*). The common dandelion, naturalized from Europe, is a highly polymorphic, ubiquitous, and pernicious weed found in lawns, open grounds, and grasslands. As it frequently reproduces parthenogenetically, hundreds of distinct populations have been recognized as microspecies (or apomicts). The leaves are sometimes used as greens, and the flowers are converted into an acceptable wine. The rhizomes and roots of the common and the red-seeded dandelion furnish a commercial drug, the therapeutic value of which is doubtful. In early spring, dandelions are important bee plants. The perennial Russian dandelion (*T. kok-saghyz*) resembles the common dandelion in appearance, but yields more latex. Now grown in Russia as a rubber-producing plant of some importance, it was introduced in the United States in 1942 but its cultivation there is still in the experimental stage. Abnormally large specimens of the common dandelion result from fasciation of the scapes and flower heads.

THEODOR JUST,
Chicago Natural History Museum.

DANDOLO, dăn'dô-lô, Enrico, doge of Venice: b. Venice, 1108?; d. Constantinople, June 14, 1205. He was elected doge in 1192, and despite his age, played a vital part in Venetian affairs. In 1202 when the leaders of the Fourth Crusade asked for Venetian ships and the use of Venice as an embarkation point, Dandolo secured in return the assistance of the Crusaders in seizing Zara (Zadar) on the Dalmatian coast. He was also responsible for further diverting the course of the Crusade into an attack on Constantinople, and he participated physically in the capture of the city in 1204. At that time Venice won many commercial advantages and numerous territorial holdings which marked an important stage in her rise as a mercantile power.

DANDRUFF, dăn'drŭf, scales forming upon the scalp in the condition known as seborrhea. The scaly condition of the head is attended by desquamation of the superficial layers of epidermis. The symptoms may indicate merely a dry-

ness of the skin, or may be due in some cases to a parasitic skin disease *pityriasis rosea*. Here there is a distinct primary lesion of pin-point size, reddish-yellow, and showing slightly greasy scales. The eruption is extremely dry and frequently invades the face, eyebrows, and eyelids in addition to the scalp. Many forms of dandruff are accompanied by itching. Scratching the head or even brushing the hair will dislodge quantities of fine, silvery scales. Continued dandruff, from whatever cause, may be followed by gradual loss of hair. If dandruff is caused by a specific disease treatment of it with an ointment containing sulphur may be beneficial. Massage, frequent shampooing, and maintenance of a clean scalp are all advised.

DANE, dān, **Nathan**, American jurist: b. Ipswich, Mass., Dec. 29, 1752; d. Beverly, Mass., Feb. 15, 1835. He graduated from Harvard in 1778, then studied law in Salem, Mass., and began to practice in Beverly in 1782. While he was a delegate from Massachusetts to the Continental Congress in 1786, he and Manasseh Cutler drafted the Ordinance of 1787 which provided for the government of the territory northwest of the Ohio River—the Northwest Territory. The ordinance was adopted by Congress on July 13, 1787. Its important prohibition against slavery had been incorporated by Dane.

DANEGELD, dān'gēld, or **DANEGELT** (Anglo-Saxon *Dene*, Dane + *gield*, payment), a land tax of the Anglo-Saxons used for maintaining forces to resist Danish invasions or to buy peace from the Danes. It was first paid in 991, when Ethelred the Unready purchased the retreat of the invaders who had reached as far as Maldon. When King Canute II of Denmark ruled England (1016–1035) the tax was levied for war purposes. Thereafter it was not used until its revival by William the Conqueror as a means of raising revenue. In 1085 William ordered the compilation of the Domesday Book to aid in this tax collection. During the reign of Henry II the Danegeld was repealed.

DANELAW, dān'lō, or **DANELAGH**, the name applied to that part of northeastern England where Danish invaders settled in the 9th and 10th centuries and where Danish law was established. See also GREAT BRITAIN—*History* (Vikings).

DANIA, dā'nī-ā, city, Florida, in Broward County, 5 miles south of Fort Lauderdale, on the Florida East Coast and Seaboard Air Line railroads, and on the Intracoastal Waterway from New York to Miami. Danes, who settled here in 1896, gave the place its name. It is the center of a tomato-raising district. The Seminole Indian Reservation is nearby. The city has commissioner-manager government. Pop. (1950) 4,540.

DANIEL, dān'yēl (Heb. "God is my judge"), is the hero and putative author of the Book of Daniel. According to this book, he was carried away from Jerusalem by Nebuchadnezzar in the third year of Jehoiakim, 606 B.C. Although at the time a youth, he was old enough to be "skilful in all wisdom, cunning in knowledge, and understanding science" (Daniel 1:4). For three years he was taught the literature and language of the Chaldeans, and at the end of this period

excelled in wisdom all the magicians and enchanters of the realm. In the second year of Nebuchadnezzar (604–603 B.C.) he was able, not only to interpret a dream of the king, but to tell him what the dream had been (Daniel 2:31–45). Later he explained the meaning of another dream which referred to a coming period of insanity in the king's life, with the result that after the humiliating experience Nebuchadnezzar was led to worship Daniel's God (Daniel 4:20–37). On the night when King Belshazzar, son of Nebuchadnezzar, was overthrown by Darius the Mede, son of Ahasuerus, Daniel read the handwriting on the wall and announced to him its solemn significance, whereupon he was clothed with scarlet and proclaimed one of the three highest rulers under the king (Daniel 5:29). This position he retained under Darius the Mede, who even contemplated making him grand vizier with authority over all others. When his rivals forced this monarch to cast him into the lions' den for breaking a royal decree in regard to religion, he was found uninjured in the morning, they were punished, and the worship of his God was enjoined upon all men in the kingdom (Daniel 6:26). Daniel not only interpreted the dreams of others but also had dreams and visions of his own, in the first year of Belshazzar, the third year of this king, the first year of Darius the Mede, the first year of Cyrus, according to the Greek, or third, according to the Hebrew, and again in the same first year, according to the Greek and Theodotus (Daniel 7, 8, 9, 10, 11).

The historical character of this Jewish sage, master of magicians and statesman, holding high positions at the court of Chaldean, Median and Persian kings in the course of 70 years, is made doubtful by certain peculiarities of statement that cannot altogether be due to errors of transcription but seem to reveal a serious want of familiarity on the part of the author or authors with the period in which the hero's career is laid. Thus there is no evidence that Jerusalem was captured by Nebuchadnezzar in 606 B.C., and he was not then king. No son of his by the name of Belshazzar sat upon the throne of Babylon. Belshazzar, the son of Nabonidus, the last king of Babylon, seems to have been mistakenly supposed to be a king and a son of Nebuchadnezzar. History knows no Darius the Mede, son of Xerxes, and immediate successor to the last Babylonian king. Darius I seems to have been meant, but he was the father of Xerxes I, and not his son, and the successor of Gaumata, not of Belshazzar.

In Ezekiel 14:14, 20, Noah, Daniel and Job are quoted as 'examples of righteousness; but it is declared that even they could only save themselves if they were in a country that had sinned and against which destruction by famine, wild beasts, sword or pestilence had been decreed. In Ezekiel 28: 2, 3, the prince of Tyre is charged with claiming that he is a god; his divinity is denied, but it is admitted that he is wiser than Daniel, and that there is no secret that can be hidden from him. If these passages were written by Ezekiel in 592 and 586 B.C., it would be difficult to avoid the conclusion that Daniel was already at that time a figure belonging to antiquity like Noah and Job. But some scholars consider them either as interpolations or as parts of a late work showing acquaintance with the book of Daniel in its earliest form. The version of the Achikar story discovered in the Elephantine papyri indicates that already in the century following the

downfall of the Assyrian empire narratives began to circulate concerning grand viziers of kings like Sennacherib and Esarhaddon, and the part that Achikar plays in the Tobit story shows how easily a popular figure of this kind could be appropriated. On the other hand, the career of a Nehemiah suggests the possibility of a nucleus of historic fact even where the extant documents are not of such a nature as to warrant a marked degree of confidence. It is perhaps significant that the name Daniel occurs in Ezra 8:2 and Nehemiah 10:6, in lists which also contain the names of Michael, Azariah and Hananiah. For literature see DANIEL, BOOK OF.

NATHANIEL SCHMIDT.

DANIEL, dà-nyél', **Anthony**, French Jesuit missionary in North America: b. Dieppe, France, May 27, 1600 or 1601; d. Teanaoste, near Hillsdale, Ontario, Canada, July 4, 1648. He joined the Society of Jesus in Rome in 1621, and in 1633 accompanied Samuel de Champlain to Quebec, where he conducted a school for Indian boys for two years. He was then put in charge of a mission at Ihonatiria, among the Huron Indians. On July 4, 1648, while the Huron warriors were absent, a group of Iroquois attacked the mission. After giving general absolution and baptizing the catechumens, Father Daniel advanced to meet the Iroquois and was shot down by their arrows. The Roman Catholic Church beatified him in 1925, and in 1930 canonized him as a saint. In the church at large his feast is celebrated on September 26, and among the Jesuits on March 16.

DANIEL, Arnaud or Arnaut or Arnault, Provençal troubadour: b. Ribérac, Department of Dordogne, France, 12th century. A member of the court of Richard Coeur de Lion, he was the author of poetry which was distinguished from that of the other troubadours by its style and metrical structure. He left about 18 lyric pieces, of which the best known is a sestina (q.v.), a poetic form he is credited with inventing. The form was used by Dante and other Italian poets.

DANIEL, dăn'yél, **John Moncure**, American journalist: b. Stafford County, Va., Oct. 24, 1825; d. Richmond, Va., March 30, 1865. While still a youth he became editor of the *Southern Planter*, at Richmond and, in 1847, of the new Richmond *Examiner*. By the force of his personality and his views he made this newspaper's name widely known and gave it great influence. Appointed United States representative at the court of Sardinia in 1853, he remained there until the secession of South Carolina from the Union, when he returned to Richmond and the editorship of the *Examiner*. He served in the Confederate army during the Civil War twice, first in 1861 and again in 1862. A duel in 1864 with the Confederate secretary of the treasury resulted in his being wounded. His writings were published by his brother, Frederick S. Daniel, in 1868.

DANIEL, **John Warwick**, American politician: b. Lynchburg, Va., Sept. 5, 1842; d. there, June 29, 1910. He served in the Confederate army during the Civil War, subsequently studied law, and entered upon the practice of his profession. He was a member of the Virginia legislature in 1869-1872 and 1875-1881, and was defeated for governor of his state in 1881. A member of Congress in 1885-1887, he entered the national

Senate in the latter year and remained there until his death.

DANIEL, **Peter Vivian**, American jurist: b. Stafford County, Va., April 24, 1784; d. Richmond, Va., May 31, 1860. After receiving his early education from private tutors, he studied at the College of New Jersey (Princeton), but did not graduate. He studied law in Richmond with Edmund Randolph, and was admitted to the bar in 1808. In 1812 he entered the state legislature, from 1812 to 1835 he was a member of the Privy Council of Virginia, and from 1836 to 1840 he was judge of the United States district court of Virginia. Named an associate justice of the Supreme Court of the United States in 1841, he remained on the court until his death. Among the important Supreme Court decisions in which he participated was the Dred Scott decision, in which he sided with the majority.

DANIEL, **Samuel**, English poet: b. near Taunton, Somersetshire, England, c.1562, d. Beckington, Wiltshire, Oct. 14, 1619. He entered Oxford in 1579, but left before receiving a degree. Daniel visited Italy in 1591-1592, was tutor to William Herbert, a nephew of Sir Philip Sidney, and later to Anne Clifford, daughter of George de Clifford, 3d earl of Cumberland; and, obtaining the favor of Queen Anne, became master of the queen's revels in 1603.

The first of his poems to be published were some sonnets included as an appendix to the 1591 edition of Sidney's *Astrophel and Stella*. In the following year he published a volume which contained the sonnet sequence *Delia* and the narrative poem *The Complaynt of Rosamond*. The sonnets, untypical of the Elizabethan sonnets because of Daniel's plain, restrained style and reflective tone, include the well-known *Care-charmer sleep! Son of the sable Night!* In the *Defence of Ryme* (1602) Daniel replied to Thomas Campion's *Observations in the Art of English Poesie* by defending the suitability of the English language for rhymed verse. A long historical poem in imitation of Lucan's *Pharsalia*, his *Civile Wars Between the Two Houses of Lancaster and York*, appeared in four books in 1595 and in 1609 in eight books, but was never completed. Daniel's other works include *Cleopatra* (1594), a Senecan tragedy; *Musophilus, a Defence of All Learning* (1599); *Philotas* (1605), a Senecan tragedy; and the court masques *The Qucene's Arcadia* (1605) and *Hymen's Triumph* (1615). His complete works, edited by Alexander B. Grosart, were published in five volumes at London in 1885-1896.

Consult Stephen, Sir Leslie and Lee, Sir Sydney, eds., *The Dictionary of National Biography*, vol. 5 (London 1937-38).

DANIEL, **Book of**. **Canonical Position and Text.**—The Christian versions of the Old Testament follow the Septuagint in placing the Book of Daniel among the Prophets. The Hebrew Bible, however, relegates it to the third canon (Hagiographa or "Holy Writings"; see BIBLE—1 *Canon of the Old Testament*), and presents it in a short and apparently original form, without the "additions" which came to be held as deuterocanonical or apocryphal, such as "The History of Susanna," "The Song of the Three Holy Children," and "The Story of Bel and the Dragon." (See APOCRYPHA.)

For some hitherto unelucidated reason, the

Hebrew Book of Daniel includes a section written in Aramaic (2:4b–7:28). One conjecture is that at an early stage of the transmission of the document an Aramaic text was substituted for a deteriorated section in which the Hebrew was illegible.

It will also be noted that the chief manuscripts of the Septuagint (*Alexandrinus*, *Vaticanus*, and others) contain not the original Septuagint version of Daniel—which has been preserved in part by one of the Chester Beatty papyri (discovered in 1933) and in the late Codex Chisianus (11th century A.D.)—but that of Theodotion (c.150 A.D.; see BIBLE—3. *Manuscripts and Versions of the Old Testament*).

Contents.—The book clearly falls into two distinct parts: one narrative (chaps. 1-6) and the other apocalyptic (chaps. 7-12). The first part consists of a series of six tales related to the life of Daniel and his companions in exile (see article on DANIEL). The second part is constituted by four visions:

(1) Four animals emerge from the sea, comparable to a winged lion, a bear, a leopard, and a beast with ten horns and "a little horn." Judged by a court presided over by "an ancient of days," the beast is put to death and the kingdom is offered to one "like a son of man" who comes from the clouds of heaven. The interpretation of the vision is revealed to Daniel: the four animals represent four empires, or those of Babylon, Media, Persia and Greece; the ten horns symbolize the Seleucids, and the little horn is Antiochus IV, known also as Antiochus Epiphanes (175–164 B.C.), who indeed persecuted the Jews for three and a half years ("a time, times, and half-a-time"); the rule of the universe shall thereupon pass unto "the people of the saints of the Most High" (chap. 7).

(2) A two-horned ram attacks westward, northward, and southward; he meets no resistance until a unicorned goat smites him. The horn of the goat is broken and gives place to four horns, out of one of which arises "a little horn"; it grows exceedingly powerful and prevents the celebration of the sacrificial worship of the prince of the heavenly host for 2,300 evenings and mornings (that is, three years and two months). The interpretation of the vision is offered to Daniel by the archangel Gabriel. The two-horned ram represents the empire of the Medes and of the Persians; the goat symbolizes the empire of Alexander and his successors. Once again the vision points to the historical figure of Antiochus Epiphanes (chap. 8).

(3) Meditating upon the predictions of Jeremiah (25:11; 29:10), Daniel intercedes on the behalf of the sinful people and receives from the archangel Gabriel an exegesis in poetic form of the Jeremianic prophecy. The number "seventy" refers not to years but to "weeks of years." During the first half of the last week (that is, 171–168 B.C.), an enemy will cause the worship of the Lord to cease, and "the abomination of desolation" (probably a Hebrew play on the term "Lord of Heavens," which commonly designates the Olympian Zeus) will stand in the sanctuary until, at the end of history, it is overthrown (chap. 9).

(4) An angelic oracle reveals to Daniel the date of the completion of time. The last Persian king is vanquished by a powerful ruler of Greece (Alexander), whose empire is divided into four kingdoms. The southern kingdom, that of the Egyptian Ptolemies, is engaged in a bitter

struggle with the northern kingdom, that of the Seleucids, until the northern king Antiochus Epiphanes causes the sacrificial offerings to cease and then goes to his death in a war with the southern king. In the midst of a frightful ordeal, the archangel Michael will appear; those whose names are written in the book will be saved, and several among the dead will rise, some to everlasting life and others to everlasting contempt; the wise will shine like the brightness of the firmament (10:1–12:4). In a supplementary vision, Daniel learns the calendar of these eschatological events: they will take place 1,290 (12:11) or 1,335 (12:12) days after the daily sacrifice is abolished in the Jerusalem temple.

Date of Composition.—There is little doubt that the author lived in the 2d century B.C.:

(1) He was not well informed on the history of the previous centuries.

(2) The Hebrew language used in the book reveals a period more recent than that of Chronicles (3d century B.C.) and quite comparable to that of Ecclesiastes (Qoheleth or Koheleth, c.225 B.C.).

(3) The Aramaic dialect used in 2:4b–7:28 also points to a late date, for it includes not only Persian but also Greek words.

(4) The ritual practices (1:8; 6:11) as well as the beliefs in a developed angelology and in the resurrection of the dead also suggest a similar period.

(5) The author is particularly well acquainted with the Seleucids and especially with the persecution of Antiochus Epiphanes, but he is mistaken concerning the actual death of this monarch (11:40) who fell, not in an encounter against Egypt but during a military expedition in Persia.

(6) More precisely, it is possible to state that the author wrote not only after the desecration of the temple by Antiochus Epiphanes (December 168) but also after the first successes of the Maccabees (11:31, 34).

(7) The announcement of the end of history for a date three and a half years after the violation of the sanctuary shows that the book as a whole was composed before June 164, and probably even before the purification of the temple by Judas Maccabee (December 165).

(8) The mathematical computations of the appendix (12:11, 12) were probably added by readers who outlived the time schedule suggested by the book as a whole (see 7:25; 8:14; 9:27; 12:7).

The date of 166–165 B.C. is generally confirmed by external evidence. The book was placed among the Hagiographa, that is, the most recent documents of the Old Testament; it implies the existence of the canon of the Prophets (see 9:2); it is never quoted or used before the Jewish sections of the Sibylline Oracles (c.140 B.C.) and thereafter is frequently referred to in the Apocalyptic literature; indeed, the fact that it is not mentioned by Jesus, son of Sirach (Ecclesiasticus, early 2d century B.C.) who otherwise knows Isaiah, Jeremiah, Ezekiel, and the Twelve, strongly implies its ulterior date.

Purpose and Significance.—The book of Daniel was composed by a pious Jew who tried to encourage his contemporaries at a time of struggle for survival. He had complete confidence in the final triumph of the God of his fathers and he assigned to his people the task of remaining faithful until the end of history. The purpose of the stories in the first part is incidentally the same as

that of the visions in the second part. In chapter 2, for example, the fall of the Hellenistic kingdoms and the rise of the Messianic realm are quite clearly depicted. In chapters 4 and 5, doom is assured for tyrannical rulers who also become blasphemers of the true God; the description of a dictator as insane (in Greek *epimanes*) may have been a sarcastic paronomasia on the name of Antiochus IV (*Epiphanes*). The significance of the book, however, may have been quite unsuspected by its author. Theretofore, Hebrew prophets had indeed included predictions of the future in their messages of condemnation and in their appeals to conversion. But their expectation of the end of history was always couched in terms of utter dependence upon the will of their God. They trusted with humility and hoped that God's time would be the good time. With the Book of Daniel, eschatological fever was transformed into apocalypticism. Some men claimed that by the application of an adequate technique they could read "the signs of the times" and predict with supernatural accuracy the date, place and program of the end. Daniel appears to have been the model of the many Jewish apocalypses which were written in the second and first centuries B.C. as well as of the Apocalypse of Saint John the Divine in the New Testament (end of the 1st century A.D.). The book has played and is still playing a paramount influence upon the calculations of Jewish and Christian millenarianists. See also APOCALYPTIC LITERATURE.

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SAMUEL TERRIEN,
Union Theological Seminary, New York.

DANIEL DERONDA, dän'yěl dē-rōn-dā, the last novel of George Eliot (q.v.), published in four volumes in 1876. Deronda was brought up in ignorance of his Jewish parentage, but finally learning of it, casts his lot with the cause of a national center for the Jews. The influence of Deronda remolds the character of the self-centered heroine, Gwendolen Harleth, who is unhappily married to Henleigh Grandcourt.

DANIELL, dän'yěl, John Frederic, English scientist and inventor: b. London, England, March 12, 1790; d. there, March 13, 1845. He was elected a fellow of the Royal Society when he was 23, and devoted himself to chemistry and meteorology. In 1823 he published *Meteorological Essays*, and in 1831 was appointed professor of chemistry in King's College, London. He invented a hygrometer in 1820, described a new pyrometer in 1830, and in 1836 won the Copley Medal of the Royal Society of London for invention of the Daniell cell, an electric battery. His *Introduction to the Study of Chemical Philosophy* was published in 1839.

DANIELL, Thomas, English landscape painter: b. Kingston on Thames, Surrey, England, 1749; d. London, March 19, 1840. He studied at the Royal Academy in 1773, and in 1784, accom-

panied by his nephew, William Daniell, began a 10-year tour of India, where he executed sketches. These were later published under the title *Oriental Scenery* (1808). Elected an associate of the Royal Academy of Arts in 1796, Daniell became a full member in 1799.

His nephew, WILLIAM DANIELL (1769-1837), executed landscapes of English and Scottish scenes, and published the four-volume *A Voyage round Great Britain* (1825). In 1799 he became a student of the Royal Academy, and was elected associate in 1807 and a full member in 1822.

William's brother, SAMUEL DANIELL (1775-1811), sketched the country and people of Africa and Ceylon, and published several works.

DANIELS, dän'yělz, Fred Harris, American engineer: b. Hanover, N. H., June 16, 1853; d. Aug. 30, 1913. He was educated at the Worcester Polytechnic Institute (M. E., 1873), and in 1873 became associated with Washburn and Moen Manufacturing Company. He remained as chief engineer when this firm was merged with the American Steel and Wire Company in 1899; after the merger with the United States Steel Corporation in 1901 he was made chairman of the board of engineers. He made special studies of iron and steel manufactures during tours in Europe, and owned many patents relating to the iron and steel industry, especially wire-rod manufacture.

DANIELS, Josephus, American public official: b. Washington, N. C., May 18, 1862; d. Raleigh, N. C., Jan. 15, 1948. He received an academic education at the Wilson Collegiate Institute, and at the age of 18 became editor of the Wilson (N. C.) *Advance*. In 1885 he was admitted to the bar but did not practice. In 1887-1893 he was state printer for North Carolina, and was chief clerk of the Department of the Interior from 1893 to 1895. He became editor of the Raleigh (N. C.) *State Chronicle* in 1885. In 1894 he consolidated the *State Chronicle* with the *North Carolinian* and the *News and Observer*, and was thereafter editor of the *News and Observer*. He took an active interest in politics, both state and national, and was publicity manager for William Jennings Bryan's campaign in 1908 and for Woodrow Wilson's campaign in 1912. From 1913 to 1921 he was secretary of the navy in President Wilson's cabinet, and through such policies as establishing courses of instruction for enlisted men in various trades, did much to bring the navy to a high point of efficiency. He was ambassador to Mexico from 1933 to 1942. He wrote several books, including *Our Navy at War* (1922), *Life of Woodrow Wilson* (1924), and *Tar Heel Editor* (1939); and edited such other works as *The Wilson Era (Peace 1913-1917)* (1944), *The Wilson Era (War 1917-1923)* (1945), and *Shirt Sleeve Diplomat* (1947).

DANIELS, Winthrop More, American political economist: b. Dayton, Ohio, Sept. 30, 1867; d. Saybrook Point, Conn., Jan. 3, 1944. He was educated at Princeton (A.B., 1888; M.A., 1890), and studied for a year at the University of Leipzig. He was professor of political economy at Princeton from 1892 to 1911, when he became a member of the board of utility commissioners of New Jersey. In 1914-1923 he was a member of the Interstate Commerce Commission, and in 1923 became professor of transportation at Yale. He wrote *Revision and Continuation of Alexander*

Johnston's History of the United States (1897); *Elements of Public Finance* (1899); and *The Price of Transportation Service* (1932).

DANIELSON, borough, Connecticut, town of Killingly, in Windham County, on the New York, New Haven and Hartford Railroad and the Quinebaug River, 25 miles northeast of Norwich. Cotton manufacturing is the principal occupation and industry. Pop. (1950) 4,554.

DANISH EAST INDIA COMPANY.
See EAST INDIA COMPANIES.

DANISH LANGUAGE, a language of the North or Scandinavian branch of the Germanic or Teutonic subfamily of the western division of Indo-European languages, spoken in Denmark. (See TEUTONIC LANGUAGES.)

Periods.—On the basis of the varying extension and consistence of the written language, the following periods may be distinguished:

Common Scandinavian, 100–900 A.D.—The language of the Runic inscriptions with the longer Futhark is the same in its main features in Denmark, Norway, and Sweden, and it is not until the 7th and 8th centuries that the sources show remarkable linguistic alterations. (See FUTHORC; RUNES.) In the inscriptions with the shorter (originally Danish) Futhark, the language has profoundly altered, the short vowels in unstressed syllables being dropped by syncope, and the vowels of the roots being modified by umlaut (q.v.). But these alterations are common for all of Scandinavia.

East Scandinavian (Runic Danish) c.900–1150.—In the Danish inscriptions from the 10th century, we find a series of new phonetic developments common for Danish and (later) Swedish sources, but unknown in Norwegian; the principal change is the transition of the diphthongs *ei*, *au*, *øy* into the long vowels *e* and *ø*. In spite of this splitting of the Scandinavian language, it was considered as a unity, which in Icelandic sources, from about 1000 to 1300, was called the Danish tongue.

Danish Provincial Languages, c.1150–1450.—In the earliest Danish manuscripts no single common Danish written language is found, but three provincial languages: the Jutland, the Zealand, and the Scanian. The oldest group of manuscripts (written about 1300) rather consistently preserves the orthography from about 1200, generally avoiding all younger dialectal innovations, but the difference between the Jutland and the Scanian is not less than that between the latter and the neighboring Swedish provincial languages, and no feature is common for all Danish manuscripts as distinct from all Swedish, the Western sources merely representing a phase in the linguistic development later than the Eastern. About 1350 the traditional orthographical norm was dissolved, and most of the manuscripts show an irregular mixture of traditional and dialectal forms.

Early Common Danish, c.1450–1800.—From the end of the 15th century there are extant groups of manuscripts in a written language which bear scarcely any mark of the writer's dialect. At the same time, a common Swedish written language arises, and thus it is not until the end of the Middle Ages that, strictly speaking, we have a Danish language common for the whole kingdom and distinct from a Swedish lan-

guage. Probably the driving forces for the establishment of these common languages were the chancelleries of the king and the conventual order of Brigittines (q.v.), which endeavored to create a religious literature in the vernacular. The great authors of the Reformation period and their printers adopted, and in details transformed, the medieval orthographic norm, but the following time brought new dissolution, until the grammarians and authors from about 1700 began to establish a standard orthography and a standard pronunciation.

Standard Danish from c.1800.—In the dictionaries of Christian Molbech (1813, 1833, 1859), the first standard orthography was codified, and this was followed by the main authors of the 19th century. In the last half of the century a group of linguists and school people struggled for an orthographical reform, bringing greater accord between the spelling of Danish and Swedish, and between spelling and pronunciation. A Scandinavian conference in Stockholm in 1869 proposed a series of alterations, some of which were admitted in the first authorized orthographical rules of June 7, 1889, which in all essentials are the basis of today's spelling.

Extension.—The old boundary between the West Germanic (Saxon) and the North Germanic tribes was the forest, originally unsettled, between Schleswig and Holstein. North of this, all of the oldest place names are Danish; in the South they are West Germanic. But as far back as the Middle Ages, the Low German and Frisian dialects pushed forward and today the border line between Danish and German nearly follows the state frontiers.

Between Danish and Swedish dialects no sharp border is to be drawn, the Scanian and Bornholm dialects occupying an intermediate place between them. In the provinces east of Öresund, or the Sound (Skåne or Scania, Halland, and Blekinge) the written and official language was Danish until they were conquered by Sweden (1658).

From the end of the Middle Ages, Danish became the official written language of Norway, and in Norwegian towns a sort of Danish with Norwegian pronunciation was spoken. Since the political connection was broken (1814), this Norwegian-Danish has developed in its own way (See NORWEGIAN LANGUAGE).

Outside Scandinavia, the "Danish tongue" (common Scandinavian) was spoken in the 10th and 11th centuries in the settlements of the Normans, of which Danelagh and Normandy (qq.v.) were principally settled by the Danes. In the United States and Canada since 1850 approximately 400,000 immigrants have had Danish as their vernacular.

Characters.—*Orthography and Pronunciation.*—Since about 1100, the Latin alphabet has been enlarged with separate signs for the vowels developed from *a*, *o*, *u* by the *i*-umlaut, namely *ä*, *ø*, *y*. Until the end of the 19th century, long vowels were often indicated by doubling the vowel (*Huus*, house, and the like); now the only double vowel is *aa*, originally a long *a*, since the 13th century spoken as a sound between *o* in *wrote* and *o* in *god*. In October 1948 there was introduced the Swedish (and Norwegian) sign *ä* in stead of *aa*. Double consonants are used between vowels only and indicate that the preceding vowel is short. The letters *q*, *x*, *z*, *c*

(in the value of *k*) and *ph*, *ps*, *th* are used only in learned foreign words. The standard pronunciation is much more in accord with the spelling than is standard English, and there is a tendency towards increasing harmony. Yet there are a great many irregularities, especially in the pronunciation of vowels. From about 1750 all nouns, according to German use, have been written with a capital in the beginning, but from Oct. 1, 1948, the use of capitals has been restricted to proper names and the beginnings of new sentences.

Inflection.—Danish holds an intermediate place between German, which preserves more of the old forms, and English, in which the inflections are reduced to a minimum. As early as in the oldest manuscripts, the substantives have lost almost all oblique cases without the genitive; the definite article has its place behind a substantive without adjective (*Mand-en*, the man). The adjective has special forms in plural, in neuter, and in connection with the definite article. In the verb, the personal endings were dropped in the Middle Ages. The plural form was preserved in the written language until 1900, but already in the medieval manuscripts it often has been replaced by the singular. The conjunctive is preserved only in fixed locutions. Compound tenses are formed by the auxiliary verbs *har* and *er*, corresponding to English *has* and *is*. A common Scandinavian innovation is the passive in *-s*, (originally the reflexive pronoun *sig*), which, however, in many applications competes with the auxiliary verb *bliver* + the perfect participle.

Derivation.—The common Scandinavian contains very few prefixes and suffixes capable of forming new words, a great many among the derived words were borrowed from the German, commencing in the 14th century, and later from the Romance languages. Some of the foreign prefixes and suffixes in these words have become productive in Danish.

Syntax.—The syntax of the Runic inscriptions and of the old provincial laws is genuine Scandinavian; but the remainder of the medieval literature is mostly translated from Latin, and here Latin constructions in several points impress the language. This influence has been corroborated by the predominant position of Latin grammar in the higher schools, but since about 1750 there has been an increasing tendency toward a construction ruled only by the genuine syntax of the spoken language. The word order is strongly fixed, and when another member holds the first place, the subject is always put behind the verb. In many clauses the conjunction is generally omitted.

Vocabulary.—Besides the genuine Scandinavian word stock, the Danish language has introduced a great many loan words, especially Low German (from 14th to 16th centuries), High German (16th to 19th centuries), Latin, and French. Most of the Germanic loan words are regarded as pure Danish and are in common use. Of the Latin and French ones, a great number were expelled from the written language by the puristic movement in the 18th century, and most of them are still not used by the general public. In recent times a number of English loan words have been adopted, especially expressions from sport and technics.

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PAUL DIDERICHSEN,
University of Copenhagen.

DANISH LITERATURE. The literature of Denmark has its roots in the common German, Anglo-Saxon, and Scandinavian conception of life and society which is reflected in the Norwegian-Icelandic eddas and sagas. But for centuries this literature was under the sway of Latin, and later came successive waves of influence from Germany, France, and the English-speaking countries—whose influence is paramount in the mid-20th century.

The languages and literatures of Denmark and Sweden separated about 1000 A.D. Denmark and Norway, however, constituted a political, cultural, and literary unit from the 14th century until 1814, and as a result several outstanding writers in Danish, among them Johan Ludvig Holberg and Johan Herman Wessel, were of Norwegian origin.

Runic Period (850-1050).—The oldest Danish literature extant is carved in Runic letters on stone. There are some 275 so-called Runic stones, actually monuments erected to the memory of eminent Vikings, bearing inscriptions. At the height of Runic culture, these were written in alliterative verses, which besides giving information about the life of the age, give an indication of the form of Old Danish heroic poetry from the period of migration, the content of which could otherwise be glimpsed only through the medium of Old Icelandic sources, the Old English poem *Beowulf* (c.700), and later Latin transcriptions of popular legends, like those by Saxo Grammaticus.

Medieval Period (c.1050-1500).—Latin, the

international language of the Catholic Church, began to supplant the Runes about the year 1000, and chronicles, annals, and lives of the saints by monastic writers predominated in Denmark during the early Middle Ages. Among these works are *The Legend of St. Canute*, written by the English monk Ælnoth about 1120; the annals of Lund, which was made the archiepiscopal seat in 1104, and the *Chronicon Roskildense* (c.1150), which is remarkable for maintaining a strongly democratic point of view in opposition to the centralization of power taking place in this period.

During the years of military expansion (1157-1227) that followed under Waldemar I, Canute VI, and Waldemar II, when Denmark obtained control of the southern Baltic coast, the royal power was celebrated in magnificent secular historical writings inspired by the brilliant warrior and statesman Absalon, archbishop of Lund. Svend Aagesen wrote a short *Historia Regum Daniae Compendiosa* (up to the conquest of Pomerania, 1185), but the flower of all medieval Danish literature in Latin is the *Gesta Danorum* (*Exploits of the Danes*) in 16 books, written between 1180 and 1219 by the otherwise unknown Saxo Grammaticus. The first nine parts, translated into English by Oliver Elton in *The First Nine Books of the Danish History of Saxo Grammaticus* (London 1894), have preserved in flowery silver-age Latin the richest treasure of ancient legends that any country can boast—among them the story of Amleth, which after many transformations grew into Shakespeare's *Hamlet*.

At the same time Catholic scholasticism culminated in the *Hexaëmeron* (*Six Days*), a gigantic Latin poem of more than 8,000 hexameters describing and commenting on the Creation. Written by Anders Sunesøn (or Sunesen, 1167-1228), archbishop of Lund, it testifies to the fine scholastic education to be had at the time in Paris and other European centers of learning.

Works in Danish.—The oldest manuscripts in the Danish language are the provincial laws which arose from oral judicial practice, and which for that reason are invaluable to the understanding of old Danish word usage and conceptions of society. The laws of Scania (Skåne) and Zealand are the oldest, but the best known is the Jutland law, promulgated by Waldemar II in 1241, with its stately foreword "*Med lov skal land bygges*" (law makes the land), written by Bishop Gunner of Viborg (d. 1251). Among a number of chronicles in Danish the most remarkable is the moralizing history of kings, the *Rimkrønike* (*Rhyme Chronicle*), in which each king tells his own story from beginning to end—birth, life, death, and burial. This was the first book to be printed in Danish, in 1495.

In the later Middle Ages the Danish language gradually gained the upper hand over Latin. Besides legends and songs to the Virgin Mary in Danish, there were popular publications containing general but rather fantastic information, like *Lucidarius* ("he who brings enlightenment"), after a German model, as well as the "medical books" of Henrik Harpestreng (d. 1244) and the pithy proverbs collected by the otherwise unknown Peder Laale (fl. 1350).

The richest treasures of medieval literature in the mother tongue, however, are the ballads, of which Denmark possesses a greater number than any other country except perhaps Great Britain. Their age is difficult to determine. Only insignificant fragments remain from the Middle

Ages, but due to a later (German) custom, a great number of ballads were preserved (though often in a damaged and distorted form) in about 40 handwritten "verse books" of the 16th century. The first printed collection, of 100 ballads, is that of Anders Sørensen Vedel (1591). The complete scholarly edition of all the ballads, in seven volumes, begun by Svend Grundtvig in 1857 and completed by Axel Olrik (1864-1917), comprises 500 to 600 ballads and about 3,000 variations. An excellent selection edited by Olrik and translated into English by E. M. Smith-Dampier appears in *A Book of Danish Ballads* (New York 1939).

Brought to Denmark during the 12th century as an accompaniment to the then fashionable chain dances, the Danish ballads form part of a great European tradition, but nevertheless have a stamp of their own, a happy blend of the imported lyrical dance-ballad and the Nordic epic poem. The ballads' content makes it evident that they originated in an aristocratic culture. This is most noticeable in the "ballads of chivalry," in which the whole life of the Danish nobility is portrayed in rich tapestries depicting family feuds, love affairs, hunting, and warfare, as well as everyday life at the castle.

Reformation Period (16th Century).—In Denmark the renaissance of art and the revival of classical learning that changed the medieval conception of life and led Europe into the modern age of exploration and expansion were preceded by the Reformation. Danish interest was focused exclusively on the struggle between the Catholics and the reformers returning from Luther's headquarters at Wittenberg, and the new art of printing produced a flood of polemic pamphlets and satires, mainly adaptations from the German (among them *The Fox Book*, *Brother Rus*, *The Death Dance*).

By far the greatest of the controversialists was the monk and undaunted champion of Catholicism, Poul Helgesen (b. 1480), lecturer at the University of Copenhagen. Helgesen wished to see a reform of the church from within and was unable to follow the reformers in open revolution against the pope in Rome, for which his opponents dubbed him Poul "Turncoat." Helgesen's most valuable historical work, the *Skibby Krønike* (*Skibby Chronicle*), so called because it was found hidden in the church wall behind the altar at the small town of Skibby in Zealand, stops in the middle of a sentence in 1534, and Helgesen's ultimate fate is unknown. His chief antagonist, the Lutheran Hans Tausen (1494-1561), became famous as the leader of the Reformation in Denmark and the author of a very popular book of sermons. The first Lutheran bishop, Peder Palladius (1503-1560), in his *Visitatsbog* (*Visitation Book*), gives a powerful picture of the common life of the period and of the human and educational problems that this imperious but humorous cleric faced on his official tours.

Far more important in the long view were the editorial labors of the humanist Christiern Pedersen (c.1480-1554), who through his printed edition of Saxo (Paris 1514) rescued from destruction the greatest work of medieval Denmark and who later contributed largely to the magnificent translation of the Bible known as the Christian III Bible (1550), to which book the development of literary Danish owes more than to any other. The most valuable contributions of the Reformation period to Danish literature, however, are the Lutheran hymns in the mother tongue. Most of

those in Hans Thomesen's famous hymnbook (*Den danske Psalmebog*, 1569) are, it must be admitted, translations from German and Latin, but the period had a genuinely original religious lyric poet in Hans Christensen Sthen (1540-1610).

Gradually the fresh, popular inspiration of the Reformation stiffened into learned theology. The cleverest of the theologians was a pupil of Melanchthon, Niels Hemmingsen (1513-1600), who was well known all over Europe. Besides dogmatic treatises he wrote *De Lege Naturae* (1572), a work that makes him the forerunner of the exponents of natural law in the following century.

Simultaneously great progress was achieved in the fields of history and natural science, though in the eyes of the age these subjects ranked far below theology. In true Renaissance spirit, great noblemen acted as patrons of the arts and sciences or practiced them themselves. Anders Sørensen Vedel (1542-1616) published a translation of Saxo (1575) and the edition of the ballads (1591) mentioned previously, but lost himself in the work preliminary to a great history of Denmark. The scholarly nobleman Arild Huitfeldt (1546-1609), however, wrote the *Danmarks Riges Krønike* (*Chronicle of the Danish Kingdom*, 10 vols., 1595-1603). Another Danish nobleman, Tycho Brahe (1546-1601), became world famous for his astonishingly accurate work in astronomy.

The theater of this period was dominated by medieval dramas performed by Latin schools, but one original play, a gay farce called *Karrig Nidding*, written by the cleric Hieronimus Justesen Ranch (1539-1607), lights up the scene. It is still played and is probably the finest Danish dramatic achievement before Holberg.

Renaissance and Baroque (17th Century).—The linking up of the people with intellectual life, one of the achievements of the Reformation, came to an end during the 17th century. In politics this was the age of absolutism, founded on the King's Law, the constitution of 1665; in religion it was the century of orthodoxy, personified in Bishop Jesper Brochmand, who upheld the divine right of kings in his *Universae theologiae systema* (1633); in literature it was the period of "learning," the age of elaborate poetry.

The great European Renaissance movement did not reach Denmark until about 1620 and then it manifested itself mainly in mere imitations of Græco-Latin, French, and German models. This obtains, too, for the main work of the Danish post-Renaissance, the *Hexæmeron* written by the coarse, ebullient Bishop Anders Arrebo (1587-1637) and printed in 1661. This religious epic poem dealing with the Creation was a free adaptation in hexameters and alexandrines of the *Seigneur du Bartas' La Semaine*. Even more imitative was the bucolic poetry introduced by Søren Terkelsen (1639-1656), cabinet secretary to King Christian IV. The redeeming virtue of this artificial poetry was its contribution to the development of a more flexible Danish language.

Amid all the unoriginality of the age, the work of two gifted poets shines brightly. One was the strolling Bohemian Anders Bording (1619-1677), who struck a charming Danish tone with his light, playful occasional verse. As editor of the first newspaper in Denmark, *Den Danske Mercurius* (founded in 1666), which presented the news in alexandrines, Bording was also the father of Danish journalism. More of the bombast of the age beset the secular poetry of the cleric

Thomas Kingo (1634-1703), but his hymns, whose resonance and majesty give them power over the human heart to this very day, prove Kingo the real master of Danish baroque literature. Kingo's hymns were collected in *Aandeligt Sjungeohor* (2 vols., 1674-1681) and many were printed in the authorized *Kirkepsalmebog* (*Church Psalm-book*), generally known as *Kingos Psalmebog*, in 1699. Ten of them appeared in English translation in *The Hymns of Denmark* by Gilbert Tait (London 1868).

In the domain of prose this was an age of memoirs. All others, however interesting, are overshadowed by the unforgettable human document that tells the story of Leonora Christina, the strong, proud wife of the unfortunate Count Ulfeld, and her harsh destiny as a prisoner in the Castle of Copenhagen. This manuscript, found in Vienna, was published in 1869. The first English translation was printed in London in 1872 as *Memoirs of Leonora Christina, Daughter of Christian IV of Denmark, Written During her Imprisonment in the Blue Tower at Copenhagen 1666-1685*.

Drama became secularized in the post-Renaissance period. One original attempt succeeded—a satirical play in the style of Molière, *Grevens og Friherrens Komedie* (*The Comedy of the Count and the Baron*, c.1675) by the nobleman Mogens Skeel (1650-1694).

Age of Holberg (1700-1750).—In Danish literary history the first half of the 18th century bears the name of the Norwegian-born professor Johan Ludvig Holberg (1684-1754), "the father of Danish literature." With his comedies in the style of Molière, but Copenhagen in tone, written between 1722 and 1728, Holberg laid the foundation of the Danish stage (later developed into the Royal Theater of Copenhagen), and created the heart and core of the national literature with a unique gallery of vigorous types like the subjugated, drunken leasehold farmer, *Jeppe of the Hill* (*Jeppe paa Bjerget*), the ignorant *Political Tinker* (*Den politiske Kandestøber*), and the foolish student, *Erasmus Montanus*. Nevertheless, as a playwright Holberg remained practically unknown outside Scandinavia, and the first English translations to do him justice were those of the three plays just mentioned, by O. J. Campbell and Frederic Schenck, in *Comedies by Holberg* (New York 1914). However, his famous social satire *Nicolai Klimii Iter Subterraneum* (*Niels Klim's Journey Underground*), a novel in the style of *Gulliver's Travels* but prudently written in Latin and published at Leipzig (1741), came out simultaneously in Danish and English translations in 1742. Another satirical work, the comic epic *Peder Paars* (1719-1720), in its depiction of ridiculous characters and backward social conditions, is a preliminary study for the comedies; in form it is a literary parody (like Nicolas Boileau's *Le Lutrin*) on bad imitations of Homer and Virgil. This poem nearly got Holberg into trouble with the authorities, and he was forced to curb his bent for satire.

The pietism that came into being after the great fire of Copenhagen in 1728 put an end to Holberg's poetry, and he turned to history (*Danmarks Riges Historie*, 1732-1735) in rivalry with Hans Gram, his superior in the study of sources but not in the art of writing, and to moral philosophy with *Moralske Tanker* (1751) and *Epistler* (1748-1754), containing more than 500 essays in the manner of Montaigne and the English *Spectator*.

tor. Holberg formed no philosophical system of his own; he was the typical representative of an age of bourgeois moderation, enlightened absolutism, and religious deism. He possessed a truly European outlook, having traversed Europe on foot in his youth, and his great work opened up to his fellow countrymen the whole modern world of G. W. von Leibniz, Alexander Pope, Christian von Wolff, Isaac Newton, John Locke, Pierre Bayle, and Hugo Grotius.

Underlying and accompanying this rationalism of Holberg's was a strong current of pietism, foreshadowed in mystics of the 17th century and now in full flower in the heartfelt hymns of Hans Adolph Brorson (1694-1764), which were collected in *Troens rare Klenodie* (*The Rare Gem of Faith*, 1739) and *Svanesang* (*Swan Song*, 1765). Lyrical love of nature, lacking in Holberg, flowed freely in the charming "arias" of Ambrosius Stub (1705-1758).

Postclassicism and Preromanticism (1750-1800).—Throughout the 18th century reason and sentiment in varying forms battled for literary supremacy. It was the age of "enlightenment," of societies for the cultivation of the Holbergian civic virtues, and of political and literary clubs and periodicals, the latter represented primarily by Jens Schielderup Sneedorff's progressive journal, *Den Patriotiske Tilskuer* (*The Patriotic Spectator*, 1761-1763), in which he discussed the emancipation of the peasants, abolition of the slave trade, school reforms, freedom of the press, and other topics of the day in a prose that has had considerable influence on later Danish writers.

The vigor of literature as such, however, was sapped by the atmosphere of reason and sentimentality. The grand style of Italian opera and French tragedy produced turgid, oratorical works like Johan Nordahl Brun's *Zarine* (1772), which are remembered only because another Norwegian, Johan Herman Wessel (1742-1785), travestied them in his immortal mock tragedy *Kærlighed uden Strømper* (*Love without Stockings*, 1772). This last, with a handful of comic tales in verse and witty epigrams, is the finest product of Danish postclassicism.

More in the style of Jean Jacques Rousseau and the English poets (Pope's *Essay on Man*, James Thomson's *Seasons*) are the didactic poems and poetic descriptions of Nature (like *Majdagen*, *May Day*, 1758) by another Norwegian, Christian Braumann Tullin (1728-1765). But surpassing all others was the author of the Danish royal anthem *Kong Christian*, Johannes Ewald (1743-1781), a wretched creature broken by hard drinking and rheumatism acquired while soldiering, but the greatest poetic genius of the century. Through his father, a clergyman, he had links with pietism; intellectually he belonged to the period of Enlightenment, emotionally to the new German renaissance inaugurated by F. G. Klopstock. With Ewald preromanticism reached Denmark. In his drama the classic Gallic style gave way to Shakespeare, Milton, Ossian, the ballads, Nordic mythology and legends, and his lyric odes sounded the noble pathos of romanticism. After Ewald's death, however, the poetic springs dried up. There followed dramas on the German model by Knud Lyhne Rahbek (1760-1830), the leading literary figure, and national tragedies and comedies, all of which were mediocre except for one comedy, *Gulddaasen* (*The Golden Box*, 1793) by Oluf Christian Olufsen (1763-1827). The figure of Peter Andreas Hei-

berg (1758-1841) commands greater respect. A radical Jacobin, who in his satires and comedies attempted to assume Holberg's mantle, Heiberg was exiled from 1800 until his death. Only one genuine poet carried the heritage into the 19th century, the restless but highly gifted and charming Jens Baggesen (1764-1826), who in humorous tales and sentimental travels (in the style of Laurence Sterne and Edward Young) combined the humor of Holberg and Wessel with the imagination of Ewald and the coming romanticism.

Romanticism (1800-1870).—Heralded by Ewald and Baggesen, but inspired directly by the German poetry of J. W. von Goethe, Friedrich von Schiller, and the Jena romantics, and by the philosophy of Immanuel Kant and F. W. J. von Schelling, disseminated through the lectures of the Norwegian philosopher Henrik Steffens at Copenhagen in 1802, the romantic period proved to be the golden age of Danish literature—thanks to a young genius, Adam Oehlenschläger (1779-1850). No profound philosopher or thinker, he yet found a happy and wonderful poetical expression for romanticism in his poem *Guldhornene* (*The Golden Horns*, 1802); in the poetic-satirical *Sanct Hansaften Spil* (*St. John's Eve Play*, 1803), mocking the would-be-wise rationalism of the 18th century; in the richly colored lyrical drama *Aladdin* (1805), whose lucky hero symbolizes Oehlenschläger's genius and the genius of the romantic movement; and finally in the powerful tragedy *Hakon Jarl* (1807), the ultimate fulfillment of Ewald's Nordic poetry. This work was followed by a long series of somewhat weaker plays and a wealth of full-toned lyric poetry, including the patriotic hymn *Der er et yndigt Land* (*There is a Fair Country*). Though he has been translated, Oehlenschläger is not greatly appreciated outside Scandinavia—where he was crowned "king of the Nordic poets" at Lund in 1829.

Bernhard Severin Ingemann (1789-1862) found a gentle childlike tone of his own in his much-loved *Morgen og Aftensange* (*Morning and Evening Songs*, 1839), while at the same time through his popular historical novels he tried to restore the Danes' faith in themselves after their defeats in conflicts with England (1801, 1807) and the loss of Norway (1814). Johannes Carsten Hauch (1790-1872) reached his best in manly, high-minded lyrical poetry. In Oehlenschläger's shadow is to be found the only erratic romantic poet among the otherwise very balanced Danish romanticists, Adolph Wilhelm Schack von Staffeldt (1769-1826).

The most impressive personality of the period, however, was the psalmist, preacher, and educator of the people, Nikolai Frederik Severin Grundtvig (1783-1872). His unique hymnology made him the leading figure in Danish church life, and his songs and his ideas concerning the emphasis to be placed on education for living rather than on book knowledge (Grundtvigianism) have had a more powerful and more lasting effect on Danish cultural life than any other influence, thanks to the Folk High School movement he inspired.

The "younger romanticism" (from about 1825) was dominated by Johan Ludvig Heiberg (1791-1860), son of P. A. Heiberg, who introduced Hegel's philosophy and supplanted Oehlenschläger, whom he denounced for careless workmanship. Heiberg stressed the importance of polished artistic form in his light dramatic

sketches set to music ("vaudevilles") and in romantic dramas, among which the national festival play *Elverhøj* (*Elves' Hill*, 1828), with its homage to love, popular traditions, and the throne, is the Danish play most often performed. The aesthetic demands of Heiberg were fully met by Henrik Hertz (1798-1870) in his immense production of romantic plays and adroit Copenhagen comedies—with leading parts written for Heiberg's wife, Johanne Luise Heiberg (1812-1890), the greatest actress Denmark has produced and a memoir-writer of extraordinary interest.

Local coloring in vaudeville appeared in response to a growing demand for "poetic realism." This came naturally to the robust and humorous portrayer of Danish nature and students' life, Paul Møller (1794-1838). Realism was still stronger in the moving poems and short stories of the clergyman Steen Steensen Blicher (1782-1848), depicting the severe, desolate life of Jutland moorland farmers. A contrast is Christian Winther (1796-1876), love's troubadour roving the smiling Zealand countryside. Other worshippers of beauty were Ludvig Bødtcher (1793-1874), seeking his themes in Thorvaldsen's Italy, and the sensual Emil Aarestrup (1800-1856); while the distinguished lyric poet Frederik Paludan-Müller (1809-1876) was a moralist, condemning the struggle for empty social success in his versified novel *Adam Homo* (1841-1848), a masterful picture of the time, written in the Byronic ottava rima.

Only two writers from the Danish golden age achieved international reputation. One was the natural genius Hans Christian Andersen (1805-1875), who published his first fairy tales in 1835. Still the grown-up irony and poetic satire of his apparently childlike tales is not fully appreciated abroad because so much gets lost through translation. The case of that curious philosopher and with Søren Kierkegaard (1813-1855) is again different. The existentialistic philosophy in which he stressed the responsibility of the individual and his development from the aesthetic to the ethic and religious phases through fear and self-examination was practically unknown abroad for almost a hundred years, until suddenly—in the mid-1930's—it became a topic of international discussion and was made accessible and commented upon in numerous foreign editions.

Toward the end of the romantic period interest in social and political affairs, paralyzed during the years of defeat and decline, awoke again. Whereas nearly all the writers mentioned above kept aloof from the conflict of the day, in the 1840's a new democratic generation of liberal university men took the lead. Meir (Meyer) Goldschmidt (1819-1887) undermined absolutism in his comic newspaper *Corsaren* (*The Corsair*), and Carl Ploug (1813-1894) celebrated in song the inter-Scandinavian students' movement, as the answer to growing German pressure through Schleswig-Holstein, and paid homage to the heroes of the first Schleswig war in 1848 and to the constitution that put an end to absolutism in 1849. From a literary point of view this was a time of romantic echoes. Jens Christian Hostrup (1818-1892), who began in the amateur student theater, continued the Heiberg traditions on the professional stage with even greater humor and heartiness; Goldschmidt depicted Jewish surroundings and characters in his novels; Hans Vilhelm Kaalund (1818-1885) and Ernst Christian Richardt (1831-1892) were fine minor poets.

But a new age dawned with the important novel *Phantasterne* (*The Fancy-mongers*, 1857), in which Hans Egede Schack (1820-1859) turned against the daydreaming of romanticism.

Naturalism (1870-1900).—It fell to Georg Brandes (1842-1927), a critic of European repute, whose lectures at Copenhagen in 1871 caused a sensation, to welcome fresh impulses from the new Europe without and to revive Danish culture after the defeat by Prussia and Austria in 1864. Under the literary influence of Hippolyte Taine and C. A. Sainte-Beuve, indebted to John Stuart Mill and to the Paris Commune of 1871 for his social theories, to the positivism of Auguste Comte and the atheism of L. A. Feuerbach for his philosophical ideas, Brandes proclaimed liberty of thought and inquiry and demanded that literature deal with realities. He was joined by the powerful lyric poet Holger Drachmann (1846-1908), ablaze with revolutionary ideas in his early poetry but later a retrograde turned romantic, by Jens Peter Jacobsen (1847-1885) a distinguished realist, whose novels *Marie Grubbe* (1876) and *Niels Lyhne* (1880) developed the Darwinian conception of humanity and depicted the break with faith, by the great Norwegians Henrik Ibsen and Bjørnstjerne Bjørnson, and later, for a while, by August Strindberg. His brother Edvard Brandes (1847-1931), the strategist of the circle, lacked stature as a dramatist but became the most influential drama critic of the period. As freethinker, reformer, and Jew, Georg Brandes encountered much opposition and at one time was forced to retire to Germany, but literary realism, the exponents of which he enumerated in *Det moderne Gennembruds Mænd* (*Men of the Modern Revival*, 1883) finally triumphed, Brandes' famous *Main Currents in 19th-Century Literature* (Eng. tr. 1901-1905) and the whole of his immense critical output became for the intelligentsia of the future what Grundtvigianism was for the rural population.

Naturalism continued in the 1880's with Henrik Pontoppidan (1857-1943), whose stark, inexorable descriptions of human society in the novel cycles *Det Forjættede Land* (*The Enchanted Land*, 1891-1895), *Lykke-Per* (*Lucky Per*, 1898-1904), and *De Dødes Rige* (*The Kingdom of the Dead*, 1912-1916) won him the Nobel Prize in 1917 and triumphed in the femininely sensitive Herman Bang (1857-1912), whose novels and short stories excel in their impressionistic descriptions of quiet lives.

The witty satirist Gustav Wied (1858-1914) carried realism into the 1890's in novels, tales, and "satyrical dramas" of a comic exuberance unparalleled since Holberg, but except for Wied the inspiration of the modern revival was spent. With Brandes taking refuge with Nietzsche in an "aristocratic liberalism," the age turned introspective and spiritual. There was a revival of lyrical poetry, refined and fervent, and not indebted to Verlaine, Baudelaire, and the French *fin de siècle* mood, exemplified in the work of Johannes Jørgensen (1866-), who was subsequently converted to Catholicism, and in the capricious, poetically witty Sophus Clausner (1865-1931), equally at home in Paris and Copenhagen. Less French influence is felt in Viggo Stuckenberg (1863-1905), the virile lover of the Danish countryside, and in the deeply religious Helge Rode (1870-1937).

20th Century Neorealism and Neoromanticism.—New forces came to the fore with

the new century. Peasants and workers took their places as literary figures beside the bourgeois, and there was a vigorous resurgence of naturalism in a social-minded regional literature. The peasant class influenced by Grundtvig is represented by Jakob Knudsen (1858-1917); the agricultural laborer by Johan Skjoldborg (1861-1936) and Jeppe Aakjær (1866-1930)—although Aakjær's agitatorial prose writings are greatly inferior to his wonderfully melodious nature poetry, which with Grundtvig's hymns and songs, is the very voice of Denmark. Like Aakjær a Jutland poet and fully his equal, Thøger Larsen (1875-1928) endowed his verse with a cosmic sense of the universe, the sun, and the stars. Other writers of value, each with his individual stamp and his own region of Denmark, include the Jutland writers Marie Bregendahl (1867-1940), Thomas Olesen Løkken (1877-), and Jørgen Nielsen (1902-1945); the Zealand writers Knud Hjortø (1869-1931) and Thorkild Gravlund (1879-1939).

With the great novel cycles of Martin Andersen Nexø (1869-1954), *Pelle Erobreren* (*Pelle the Conqueror*, 1906-1910) and *Ditte Menneskebarn* (*Ditte, Child of Man*, 1917-1921), which are surpassed only by his memoirs, published in the United States as *Under the Open Sky* (1938), the worker is allotted his rightful place in literature, as in the community. From Nexø a series of liberal social-minded writers descend in an unbroken line through the 1920's and 1930's. Among the moderates are Leck Fischer (1904-) and Knuth Becker (1893-); strongly Communistic like their master are Harald Herdal (1900-), Hans Kirk (1898-), and Hans Scherfig (1905-)—the last two witty satirists and castigators of the social system.

Overshadowing the regional writers is the greatest talent of the century, Johannes Vilhelm Jensen (1873-1950). Jensen greeted modern technical advances with wild applause in his manifesto *Den gotiske Renaissance* (*The Gothic Renaissance*, 1901), partly inspired by his visit to the America he describes in the novels *Madame d'Or* (1904) and *Hjulet* (*The Wheel*, 1905). In the imaginative novel cycle *Den lange Rejse* (*The Long Journey*, 1908-1922) Jensen describes the white man in triumphant battle with Nature from the earliest times to Christopher Columbus, traces with Kipling the migration of the race from Jutland to the Far East, and returns home like the Vikings of old to end as the last true Darwinist seeking to still his longing for eternity in an intense experience of Nature and man. Like Hans Christian Andersen, Jensen uses a form of his own, the "myth," a blend of inspired fable, fine journalism, scientific knowledge, and beautiful lyric poetry. Despite the fact that he received the Nobel Prize in 1944, Jensen is still little known in England and America.

Among other writers of good prose were the wistful novelist Harald Kidde (1878-1918), child of the 1890's, and the superfeminine Karin Michaëlis (1872-1950), whose work is well known abroad. There were also two good poets, the satirical Harald Bergstedt (1877-) and the heroic Valdemar Rørdam (1872-1946), both of whom fell into political discredit during World War II. None, however, influenced the coming generation of writers so much as Johannes V. Jensen. This is especially true of the leading lyrical poet and novelist of the 1920's, Tom Kristensen (1893-), whose work is stamped with the disillusionment born of World War I

and whose style is that of contemporary German expressionism. It is less true, however, of a critical mind like Jacob Paludan (1896-), who sums up in his novels the spiritual insolvency of the war period.

In the 1930's a neoromantic reaction set in against the now exhausted social naturalism. Nis Petersen (1897-1943), a vagabond teller of tales and a magnificent lyric poet, won international recognition with his novels *Sandalmagerens Gade* (*The Street of the Sandalmakers*, 1931) and *Spildt Mælk* (*Spilt Milk*, 1934). Isak Dinesen (pseudonym of Baroness Karen Blixen-Finecke) published her *Seven Gothic Tales* (1934) in English first, and there were also original English editions of her other masterpieces *Out of Africa* (1938) and *Winter's Tales* (1943).

The Danish theater, following a century of barrenness, was enriched by the dynamic genius of the clergyman Kaj Munk (1898-1944) with plays like *En Idealist* (*An Idealist*, 1928) and *Ordet* (*The Word*, 1932). After an antidemocratic period as a political problem child in the 1930's, Munk took the national side in the fight against German dictatorship in 1940—expressed in his plays *Niels Ebbesen* (1942) and *Før Cannae* (*On the Eve of Cannae*, 1943)—and became a national symbol through his death at the hands of the Germans during the occupation. Kjeld Abell (1901-), as *Anna Sophie Hedvig* (1939) demonstrated, is a playwright with a fine gift of invention. The production of Carl Erik Soya (1896-) is striking but more problematic.

The revolt against naturalism continued in the 1940's, leading the way to a poetic, imaginative symbolism. Martin Alfred Hansen (1909-) is outstanding, with novels like *Lykkelige Kristoffer* (*Lucky Christopher*, 1945) and profound short stories like *Tornebusken* (*The Thornbush*, 1946), written in a difficult, pithy Danish which was influenced by Johannes V. Jensen. Other writers of quality and delicate sensibility are Hans Christian Branner (1903-), with short stories like *To Minutters Stilhed* (*Two Minutes' Silence*, 1944) and plays like *Rytteren* (*The Rider*); the novelist Aage Dons (1903-); and the novelist and playwright Knud Sønderby (1909-). Paul la Cour (1902-) is a refined lyric poet.

The German occupation inspired a literature of its own, in which the diaries and letters of the young men of the resistance have lasting value as unforgettable human documents. The 1940's were also an age of poetry. In the serious verse of Halldan Rasmussen (1915-) and the intense Erik Knudsen (1922-) is reflected all the anxiety of the atomic age. The most gifted among the youngest poets is Frank Jäger (1926-), but there are others of great promise.

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HARALD ENGBERG,
"Politiken," Copenhagen.

DANISH MUSIC.—Music in Denmark is of very ancient origin. The discovery of the great antique bronze horns, the *Lur*, dating from the Bronze Age (1000 to 2000 B.C.) indicates that the tradition of Scandinavian music, and of Danish music in particular, goes back further than that of any other of the present cultured peoples of Europe. In Denmark, the first of these large horns was unearthed near Copenhagen in 1797, and up to the present time about 40 have been discovered in Scandinavia, more than half of them in Denmark. (See also SCANDINAVIAN MUSIC.)

Of more recent history are the many references to music found in the sagas and the old scaldic poetry. The close contact with England undoubtedly influenced Danish music, as in turn both Danish and Norwegian traditions affected the music of the British Isles. (See also NORWEGIAN MUSIC.)

With the coming of Christianity at the end of the 10th century, the pagan poetry and songs gradually gave way before the authority of church music, and for the next 500 years the Gregorian chants of the Roman Catholic Church dominated Danish music and influenced both the art music of the court and the folk music of the people. But this folk music, the *musica vulgaris*, also had its effect on sacred music. Thus a hymn in honor of St. Knud, dating from the middle of the 12th century, was sung to a spirited melody in C major, a scale not permitted in church music of the time. Music manuscripts from the Middle Ages indicate a high degree of musical culture. The church music was mainly vocal and instrumental music was considered less important. Large church organs were not common and in many of the churches small portable organs were used to assist with the instruction in singing. The organist played with his right hand and pumped the bellows with his left.

Instrumental music was very popular among the people, the most important instruments being the old Nordic harp, the fiddle, gigja, lute, trumpet, drum, and bagpipe. The harp and lute served to accompany the songs of wandering minstrels. The life of these first "professional" musicians was a precarious one, since the church regarded them as servants of the devil, and the law afforded little protection. Despite these difficulties, however, they were found at every festive gathering, from the king's court to the village fair, and as time went on, their position improved until they eventually received universal respect and admiration.

Danish folk music of the oldest period is some-

what monotonous in melodic line and serious in character. The earliest recorded example of a Danish folk melody was found in a 13th century law book. The text of this fragment is in runic lettering, and tells how the singer dreams of silk and treasured cloth. Printed collections appeared as early as 1591, when a volume of songs was issued by Anders Sørensen Vedel. In 1695 about 200 folk songs were collected and printed by Peder Pedersen Syv (1631-1702).

When Christian IV ascended the throne in 1588, a new and brilliant period was inaugurated in Danish music. Throughout his long reign (1588-1648) the king was one of the foremost patrons of music in Europe. At the coronation festivities in 1596 the royal musicians numbered 61 players, including 23 trumpeters with all-metal blow instruments of pure silver. King Christian invited many famous foreign musicians to visit his court, among whom were John Dowland, William Brade, Thomas Simpson, and Thomas Cutting from England; Gregorius Trehau and Melchior Borchgrevinck, from the Netherlands, and the noted Heinrich Schütz from Germany. A great favorite with the king, John Dowland (1563-1626) remained at the Danish court as luteist from 1598 to 1606, and received a salary equal to that of an admiral of the realm. Most of the singers in the royal choir were imported from Italy. But the king also encouraged native talent, and among the outstanding Danish musicians of the time were Mogens Pedersøn, (c. 1580-c. 1630), Hans Nielssøn, Jacob Ørn, and Andreas Aagessøn.

The 16th and 17th centuries were also the richest period in Danish church music, culminating in the work of the famous organist and composer, Diderik Buxtehude (1637-1707, q.v.). Buxtehude has often been called a Swedish musician, but his family was Danish for several generations, and he was born in Halsingborg, across The Sound from Helsingør (Elsinore) where he grew up. Halsingborg, his birthplace, though now in Sweden, belonged to Denmark until 1658. The traditional story of how the 20-year-old Johann Sebastian Bach traveled 20 miles on foot to hear Buxtehude play is well known. He made a deep impression on Bach. Buxtehude's compositions included over 100 cantatas; numerous trio sonatas for strings; and many magnificent works for organ.

During the 18th century the influence of foreign art music was dominant. In 1702 the Royal Opera opened in Copenhagen, and operas were given in the Italian style by Italian singers. For a time during the year 1749 Christoph Willibald Gluck served as one of the conductors. The more nationally minded of the Danes gathered around the Norwegian dramatist Ludvig Holberg (1684-1754, q.v.), professor of history at the university in Copenhagen. Holberg, who is regarded as the founder of Danish literature, organized together with his friends the first society for promotion of public concerts. This movement was one of the factors that helped in fostering the first Danish song-plays (*sangspil* or *syngespil*), *The Death of Balder* (*Balders Død*) which was performed by royal command March 9, 1778, and *The Fishers* (*Fiskerne*, 1770 or 1780). The texts to these were by the Danish poet Johannes Ewald (1743-1781) and the music by the German composer Johann Ernst Hartmann (1725-1793); also the equally important works, *The Autumn Feast*

(*Høstgildet*, 1790) and its sequel *Peter's Wedding* (*Peters Bryllup*, 1793), both to texts by the Danish writer Thomas Thaarup (1749-1821) and the music by the German composer Johan Abraham Peter Schulz (1747-1800) who in 1787 came to Copenhagen as royal court conductor. He left Denmark in 1795.

Composers of the 19th and 20th centuries.—Although at the beginning of the 19th century Danish music was dominated by German influences and musicians, there gradually appeared a number of gifted native composers who helped create a representative national music. The important composers from 1800 to the present are as follows:

Christoph Ernst Friedrich Weyse (1774-1842) came to Copenhagen from Germany in 1789. In 1795 he wrote four symphonies. These were later rewritten and the fourth was used in 1817 as overture and entr'acte music to Shakespeare's *Macbeth*. In 1796-1799 he wrote three additional symphonies. One of the first composers to introduce romanticism in Denmark, he composed seven major musical dramatic works in Danish: *The Sleep Potion* (*Sovedrikken*, 1808), *Faruk*, 1811, *Ludlam's Cave* (*Ludlams Hule*, 1814) to a text by Adam Gottlob Oehlenschläger (1779-1850), *Floribella*, 1824, *The Adventure in the Rosenborg Gardens* (*Et Aeventyr i Rosenborgs Have*, 1827), *The Death of Balder* (*Balders Død*, 1832) and the *Feast at Kenilworth* (*Gesten paa Kenilworth*, 1835) to a text by Hans Christian Andersen (1805-1875); about 30 cantatas, choral music, organ pieces, piano pieces, and many popular songs. He edited 100 Danish folk songs which were later published by his pupil, Andreas Berggreen.

Friedrich D. R. Kuhlau (1786-1832, q.v.) was also important in promoting Danish opera. Kuhlau came to Copenhagen from Germany in 1810. In 1813 he received the title of chamber musician (*Kammermusiker*) without salary. In 1818 he received 300 rigsdaler in salary, with the stipulation that he play at court concerts and yearly write a work either for the court or for the theater. In 1828 his salary was increased to 600 rigsdaler. Among his important works are the operas *The Robber's Castle* (*Røverborgen*, 1814); *The Magic Harp* (*Trylleharpen*, 1816) to a text by Jens Baggesen (1764-1826); *Elisa*, 1820; *Lulu*, 1824 to a text by C. H. F. Güntelberg; *Hugo and Adelheid*, 1827. He wrote music to the play *William Shakespeare*, 1826 by Gaspar Johannes Boye (1791-1853), and to the national play *The Elfín Hillock* (*Elverhøj*, 1828), by Johan Ludvig Heiberg (1791-1860); two piano concertos, much piano music and chamber music, cantatas, and songs.

Andreas Peter Berggreen (1801-1880) was an organist, composer, and one of the teachers of Niels Gade. He worked for 28 years on an 11-volume collection of folk songs: *Folk Songs and Melodies, National and Foreign, Collected and Arranged for Pianoforte* (*Folkesange og Melodier, Fædrelandske og Fremmede, Samlede og Udsatte for Pianoforte*). Occasionally, Berggreen tried unsuccessfully to restore some of the old melodies by forcing them into a modern harmonic mold, and as a result, the authenticity of certain melodies can be questioned. Nevertheless, this collection remains an outstanding achievement. Berggreen's compositions included a comic opera. *The Picture and the Bust* (*Billedet og Busten*, 1832); stage music, a cantata,

songs for school use, and church music. He also published a valuable collection of psalm tunes in 1853.

Johan Peter Emilius Hartmann (1805-1900) was the son of August Wilhelm Hartmann, organist at the Garrison Church in Copenhagen, and the grandson of Johan Ernst Hartmann, leader of the court orchestra from 1768 to 1793. Known as, the father of Danish music, J. P. E. Hartmann was a leading figure in the development of Danish national music during the 19th century. He drew upon Danish nature, history, and folk music for inspiration, and his music is regarded as being more characteristically Danish than that of any other composer. Hartmann's talent is shown to best advantage in the large, polyphonic choral compositions which he wrote late in his life. His many works, about 200, smaller songs not included, covered a wide variety of forms, including three operas, *The Raven* (*Ravnen*, 1832), to a text by Hans Christian Andersen; *The Corsairs* (*Corsarerne*, 1835); and *Little Kirsten* (*Liden Kirsten*, 1846); several melodramas, of which the best known are *The Golden Horns* (*Gulhornene*, 1832) and *At the Cloister Gate* (*Foran Sydens Kloster*, 1872); several ballets, including *The Valkyrie* (*Valkyrien*, 1861), and *Thrym's Lament* (*Thrymskviden*, 1868); incidental music to several of Adam Gottlob Oehlenschläger's tragedies, and other plays; two symphonies, in G Minor, and in E Major; various overtures, such as *Hakon Jarl* (1844), *Axel and Valborg* and *Correggio*; works for soli, chorus and orchestra, including *The Wedding of the Dryad* (*Dryadens Bryllup*, 1858 or 1859), *A Summer Day* (*En Sommerdag*, 1854 or 1856), *Song of the Gypsies* (*Zigeunersang*), *Beyond the Mountains* (*Hinsides Bjergene*). In *Provence*, 1869, *St. Olav* (*Olav den Hellige*, 1838) and *The Sibyl's Prophecy* (*Vølvens Spædom*), the latter perhaps his most powerful and characteristic work; a violin concerto; a piano quartet; a violin suite; sonatas for the violin, the organ, the flute, and the piano; cantata, choral works, solo songs, church music, and four volumes of piano music. In 1865 Hartmann became one of the directors of the Conservatory of Music at Copenhagen.

Hans Matthison-Hansen (1807-1890) was a famous organist who composed the oratorio, *Johannes*; orchestral music, chamber music, organ sonatas, cantatas, hymns, and some secular songs.

Henrik Rung (1807-1871) was a choral conductor and chorusmaster at the Copenhagen Royal Opera. In 1851 he founded and became director of the Cecilia Society, an organization specializing in early church music. He composed incidental music for plays, choruses, and many universally known Danish songs.

Hans Christian Lumbye (1810-1874) has a definite place in 19th century Danish music. Known as, the northern Strauss, he conducted his own orchestra at the Tivoli Gardens in Copenhagen, and composed many marches and much excellent dance music.

Holger Simon Paulli (1810-1891) was a violinist and conductor, who, together with Hartmann and Gade, became one of the cofounders and codirectors of the Copenhagen Conservatory of Music in 1866. From 1863 to 1883 he was principal conductor of the Copenhagen Court Orchestra, and presented the first perform-

ances of Wagner's operas in Denmark: *Lohengrin*, 1870; *Meistersinger*, 1872; and *Tannhäuser*, 1875. His own works included the little song-play or sangspil, *The Pilot* (*Lodsen*, first performance 1851); several ballets, a concert overture, a collection of violin études, and songs.

Edvard Helsted (1816-1900) was a violinist who from 1863-1869 held the post of concertmaster of the court orchestra. He composed several ballets and other works for the stage.

Niels Wilhelm Gade (1817-1890, q.v.) is generally regarded as the most prominent Danish composer of the 19th century. The son of an instrument maker, he was first apprenticed in this profession, but his marked talents as a violinist determined him to become a musician, and he studied with Berggreen. In 1839 he was commissioned to write music for Oehlenschläger's drama, *Aladdin*; and in 1841 he won the coveted prize given by the Copenhagen Musical Society for his overture, *Echoes from Ossian* (*Efterklange af Ossian*). He sent his First Symphony in C Minor to Felix Mendelssohn in 1842, and this led to a meeting and close friendship between the two men. From 1844-1846, he served as assistant conductor, and from 1847-1848, after Mendelssohn's death, as principal conductor of the famous Gewandhaus concerts in Leipzig. In 1848 he returned to Copenhagen, and 13 years later was appointed court conductor. Save for occasional trips abroad, to England in 1876 and 1882, he remained the rest of his life in Denmark. Together with his father-in-law, J. P. E. Hartmann, Gade was the foremost representative of the Danish romantic school. Influenced first by Mendelssohn and later by Robert Schumann, Gade's orchestral works reveal a fluent style with an admirable sense of proportion and balance. While the folk element is present in some of his music, he remained apart from the more nationalist trends. Gade wrote one opera, *Marriotta* (1848-1849); eight symphonies, in C Minor, E, A Minor, B Flat, D Minor (with piano), G Minor, F, and B Minor; the eighth and last symphony in 1870; the overtures, *Echoes from Ossian* (1840), *In the Highlands* (*I Højlandene*, 1844), in C, *Hamlet*, *Michel Angelo*, and *In the Mountains* (*Mellem Fjeldene*); the orchestral suites, *A Summer Day in the Country* (*En Sommerdag paa Landet*) and *Holbergiana*; a violin concerto; three marches; *Festmusik* for the Copenhagen Exposition of 1872; four *Novelettes* for string orchestra; a string octet; a string sextet; a string quintet; a piano trio; four violin sonatas; a piano sonata, and other piano music; 15 cantatas, of which the best known are *Comala*, inspired by the poetry of Ossian, *The Crusaders* (*Korsfarerne*), and especially *The Erlking's Daughter* (*Elverskud*), an idealization of the Danish folk song; part songs for different combinations of voices, solo songs, and ballads.

Carl Adolph Helsted (1818-1904), brother of Edvard Helsted, wrote two symphonies, choral works, and piano music.

Peder Arnold Heise (1830-1879) was the foremost lyric composer of Denmark. He wrote 187 songs to texts by leading Scandinavian and foreign poets, and he generally succeeded in enhancing the poetic qualities of these texts by rich flowing melodies and characteristic accompaniments. He also wrote two operas, *The Pasha's Daughter* (*Paschaens Datter*, 1865), and *King and Marshal* (*Drot og Marsk*, 1878), the

latter called a tragic song drama, text by Christian Richardt, first performance in 1878 and based on episodes from medieval Danish history; a ballet *Kort Adeler*; other works including stage music, a symphony, overtures, and a piano trio.

Johan Gottfred Matthison-Hansen (1832-1909) was the son of Hans Matthison-Hansen. An eminent organist, he joined Edvard Grieg, Christian Emil Horneman and Rikard Nordraak in organizing the Euterpe Society (1865) for the purpose of fostering Nordic music. He wrote chamber music, pieces for piano, and for organ and other compositions.

Johan Adam Krygell (1835-1915) was an able organist and composer whose works included the opera, *Saul*; symphonies, overtures, an oratorio a Mass, 24 string quartets, a septet, and many fine organ pieces.

August Henrik Winding (1835-1899) was a pianist and composer who wrote a Symphony in D Minor; two overtures; a violin concerto, a piano concerto; a Concert Allegro for piano and orchestra; chamber music, choral music, songs, many piano pieces, and cadenzas for all of Mozart's piano concertos, and for Beethoven's Third and Fourth Piano Concertos.

Emil Hartmann (Wilhelm Emilius Zinn Hartmann, 1836-1898) was the son of J. P. E. Hartmann. His compositions included the four operas, *The Elf Maiden* (*Elverpigen*, 1867), *The Corsicans* (*Korsikamerne*, 1873), *Bagahjøl*, and *The Magic Runes* (*Tryllerunger*, 1896); the ballet, *The Mountain Hut* (*Fjældstuen*); three symphonies; an overture; several orchestral suites, a violin concerto; a cello concerto; chamber music, a cantata, and songs.

Christian Fredrik Emil Horneman (1841-1906) was the cofounder with Grieg, Nordraak, and J. G. Matthison-Hansen of the Euterpe Society. He composed the opera, *Aladdin* (1888), stage music; the overture, *Heldenleben*; piano pieces, and songs.

Asger Hamerik (originally Hammerich, 1843-1923) was an eminent composer and conductor, who from 1871 to 1898 served as director of the Conservatory of the Peabody Institute, Baltimore, Md. His compositions included among others, four operas, seven symphonies, five *Northern Suites* for orchestra, chamber music, cantatas, choral works, and a requiem.

Ludvig (Ludwig) Theodor Schytte (1848?-1909) was a pianist and composer who wrote two operas and two operettas, a *Barcarolle* for piano and strings, a piano concerto, piano pieces, and songs.

Otto Valdemar Malling (1848-1915) was an organist, composer, and conductor, who wrote a ballet, a symphony, orchestral works, a piano concerto, chamber music, choral works, and songs.

Peter Erasmus Lange-Müller (1850-1926) was an important Danish composer whose works included the operas, *Tove* (1878), *Spanish Students* (*Spanske Studenter*, 1883), *Fru Jeanna* (1891), and *Viking Blood* (*Vikingeblood*, 1900), stage music; two symphonies; the orchestral suites, *Alhambra*, and *Weyenburg*; a violin concerto; chamber music, piano suites, cantatas, choral compositions, vocal quartets, and about 200 songs, among which are some of the finest in Danish song literature.

Siegfred Langgaard (1852-1914) was a famous pianist who wrote many outstanding piano pieces and songs.

Frederik Rung (1854-1914) was the son of Henrik Rung. His compositions included the operas, *The Secret Society* (*Det Hemmelige Selskab*, 1888) and *The Three-Cornered Hat* (*Den Trekantede Hat*, 1894); two ballets; stage music; a Symphony in D Minor; other orchestral works, two string quartets, other chamber music, piano music, choral works, and songs.

August Enna (1860-1939, q.v.) was primarily a self-taught composer. His music was fresh and melodic, with much individuality. He wrote the operas, *The Witch* (*Ilekken*, 1892), still popular in the repertoire of the Royal Theater; *Kleopatra*, 1894; *Ancassin and Nicolette*, 1896; *The Little Matchseller* (*Pigen med Iyrtikkerne*, 1897); *Young Love* (*Ung Elskov*, 1897-1902); *The Nightingale* (*Nattergalen*, 1912); *Gloria Arsena*, 1917; and *The Jester* (*Narren*, 1920), three early operettas, including *A Village Tale* (*En Landsbyhistorie*, 1880); two ballets, *The Shepherdess and the Chimney Sweep* (*Hyrdinden og Skorstensfeieren*, 1901) and *St. Cecilia's Golden Shoe* (1904); two symphonies, in D Minor, and in C Minor; other orchestral works which include a violin concerto; choral music, and songs.

Axel Willi Gade (1860-1921) was the son of Niels Gade. A violinist, he composed the opera, *Enchanted Night* (1918), a violin concerto, chamber music, and others.

Carl Nielsen (August Carl Nielsen, 1865-1931) was the leader of the younger Danish composers emerging between the last quarter of the 19th and the first quarter of the 20th centuries. He was principally an orchestral composer, and his music, often austere and broad in its melodic line, showed originality in both ideas and development. He has been called the Danish Sibelius. Among his many compositions were two operas, *Saul and David* (1903), and *Muskarade* (1907); six symphonies; the overture, *Helios*; the orchestral fantasy, *Pan and Syrinx*; two orchestral suites; three string quartets, and other chamber music; the choral works, *Hymnus Amoris* and *To Sleep*; cantatas, piano pieces, and songs.

Hakon Børresen (1876-) has composed the operas, *The Royal Guest* (*Den Kongelige Gaest*, 1919), and *Kaddara* (1921); three symphonies; a violin concerto; two string quartets, and other chamber music; also piano pieces, and many outstanding songs.

Ludolf Nielsen (1876-1939) was a violinist, conductor, and composer, who wrote two operas, *Isabella* (1915), and *The Clock* (*Uhret*); a ballet, *Lakschmi*; three symphonies; an overture; the symphonic poems, *Ragnar Lodbrog*, *Summer Night Mood* (*En Sommernatsstemning*), *In Memoriam*, *From the Mountains* (*Fra Bjærgene*), and *The Tower of Babel* (*Babelstaarnet*); other orchestral music; two string quartets, and other chamber music; the choral work, *St. Hans*; piano pieces, and songs.

Rudolf Immanuel Langgaard (1893-) is the son of Siegfried Langgaard. An outstanding technician with a rare gift of poetic expression, he has written symphonies, chamber music, organ music, choral works, piano pieces, and over 100 songs.

Jørgen Bentzon (1897-) belongs to the modern school, and has written chamber music and other works in a contrapuntal style.

Knudaage Riisager (1897-) is also of the

modern Danish school. He has composed a fairy operetta; a burlesque ballet, *Benzin*; three symphonies; two overtures; *Variation on a Theme of Mœzangeau*; a *Dionysian Suite*; other orchestral music, four string quartets, and much other chamber music; choral music, piano pieces, and songs.

Besides these mentioned, there are many more excellent Danish musicians who have composed good music in all the forms; especially a wealth of folklike songs dear to every Dane.

Musicologists and Musical Activities.—Some of the leading writers on Danish music are as follows:

Svend Hersleb Grundtvig (1824-1883) was a philologist and folklorist. He issued a collection of English and Scottish folk songs in 1842 which he translated with a fine poetic and linguistic ability. In 1850 he began to publish his life-work, *The Old Folk Songs of Denmark* (*Danmarks gamle Folkeviser*), which included all variations of both text and melody for each song. This concise manner of evaluating and classifying folk songs has served as a model for collectors in other countries. At the time of his death five large volumes had been published, also 15 volumes of folk songs of the Faeroe Islands (*Færøske Folkeviser*), and his work was continued by Axel Olrik (1850-1917).

Carl Thrane (1837-1916) wrote a history of the Court Chapel in Copenhagen from 1648 to 1848, *From the Time of the Court Violins* (1918).

Vilhelm Carl Ravn (1838-1905) published a work on English instrumentalists at the Danish court.

Angul Hammerich (1848-1931) was the brother of the composer, Asger Hamerik, and one of Denmark's foremost musicologists. A professor of musical history at Copenhagen University, he wrote many valuable works, among which were *Medieval Musical Relics of Denmark*, translated into English in 1912, and *Danish Music History up to c.1700* (*Dansk Musikhistorie indtil c.1700*), published in 1921.

Thomas Linnemann Laub (1852-1927) collected Protestant church music and Danish folk songs.

Hortense Panum (1856- ?) is one of Denmark's prominent musicologists. Her most important work is *The Stringed Instruments of the Middle Ages* (*Middelalderens Strengemstrumenter og Deres Forløbere i Oldtiden*). Together with William Behrend (1861-), she wrote an illustrated *Musikhistorie* (1897-1905).

Hjalmar Lauritz Thuren (1873-1912) made researches in Danish, Faeroe, and Eskimo folk music. He wrote *The Folk Songs of the Faeroe Islands* (*Folkesangen Paa Færøerne*).

Jen Jacob Aarsbo (1878-) wrote *Danish Folk Song from the 19th Century* (*Dansk Folkesang fra 19de Aarhundrede*), and *From the History of Danish Music* (*Fra den Danske Musiks Historie*).

Erik Abrahamsen (1893-) has been in charge of the music section of the royal library since 1918. He has written about Danish church music, particularly of the influence of Gregorian chants on Danish folk music.

The Danish University Students Chorus (male voices) was organized in 1839; and the Conservatory of Music at Copenhagen was established in 1865. Denmark has the greatest collection of old musical instruments in Scandinavia. In Den-

dio (1880); *Breakfast of the Model* (1881); *A Child's Funeral at Villerville* (1883). He was a regular exhibitor at the Salon des Artistes Français and elsewhere throughout France. He also illustrated many of the works of Victor Hugo and Émile Zola.

DANTE ALIGHIERI, dān'tē ä-lē-gyā'rē, Italian poet: b. Florence, Italy, May 1265; d. Ravenna, Sept. 14, 1321. Dante was the first important, and at the same time the greatest, of all Italian poets. An eager student of the classics and of theology, he was also an active participant in the political life of his city. He took part in the victory over the Ghibellines at Campaldino in 1289, became alderman in 1296, and prior in 1300. Dante belonged to the moderate wing, the Bianchi, of the Guelphs, but because of the intrigues of Pope Boniface VIII and the intervention of Charles of Valois, brother of the king of France, the Bianchi were overthrown (November 1301) by the radical wing of the Guelphs, the Neri, and Dante and his companions were exiled early in 1302. Thus began a period of restless wandering and increasing bitterness, during which Dante "as a pilgrim, almost as a beggar," "a barque without sails and without rudder," learned "how salty the bread tastes in others' houses, and how hard is the going up and down of others' stairs." His wanderings over large parts of northern and central Italy ended only with his death; in 1316 he scornfully rejected a Florentine amnesty and a humiliating permission to return home. During his exile his political convictions underwent a profound change, and he associated himself with Can Grande della Scala at Verona, one of the great leaders of the Ghibelline party. He died and was buried in Ravenna, at the court of Guido Novello da Polenta and to this day Ravenna has refused to permit his bones to be brought back to his native city which had so bitterly wronged him.

Beatrice Portinari and Gemma Donati were the two most important women in Dante's life. The former was the love of his youth, whom according to the *Vita nuova* he met at the age of nine and worshiped throughout his life, even after her marriage to Simone de' Bardi and her premature death in 1290. Gemma became Dante's wife (1277) and bore him several children (we know the names of Pietro, Jacopo, and Beatrice), but either could not or would not follow her husband into banishment. Other data on Dante's life are of dubious veracity: that he was of lower aristocracy, possibly of distant Germanic origin, perhaps a pupil of Brunetto Latini; that he studied in Paris under Siger de Brabant and even visited Oxford during his banishment; that Beatrice reciprocated his love; that he had seven children, was unhappily married, and loathed his wife.

In view of the impossibility of providing accurate dates for Dante's works, it seems best to subdivide his life into three periods of spiritual development and to assign to each phase the works most germane to that stage. The earliest phase, from 1283-1290, was dominated by the ardor of youth and the religious transformation of his great love for Beatrice; this is reflected in the course of the *Vita nuova*. The second phase, starting with her death, brought into his life grief, despair and doubt; it led to a momentary victory of reason over faith, to an increasing preoccupation with philosophy and science, to bitter political strife, scorn, hatred, and schem-

ing. The *Convivio*, *De Monarchia*, the *Epistles*, and, to a lesser extent, *De vulgari eloquentia*, would seem to be the fruits of this period. It ended in 1313, with the death of Emperor Henry VII, in whom Dante had put all his hopes. The sudden collapse of all his worldly plans, instead of crushing him, restored in him a spiritual equilibrium and brought him back to the faith of his youth and the worship of a hallowed Beatrice as charity incarnate, to which every canticle of the *Divine Comedy* bears testimony.

Dante's early lyrical poems, provided with prose connections and lengthy philosophical interpretations, were partly integrated in his two great collections, the *Vita nuova* and the *Convivio* (the latter often also called the *Convito*, the *Banquet*, or the *Love-Feast*). The tenor of Dante's own interpretations of his sonnets and odes on love indicates his gradual transition from faith to reason. The *Vita nuova*, often called the first romance of love and the first psychoanalytical probing into the deeper emotions of a poet, tells in its triple mixture of narrative prose, lyrical poems, and running commentaries on these poems, of Dante's first meeting with Beatrice in 1274, the beginning of a new life and an inner regeneration, of her beauty and sweetness, his hope and adoration, his suffering and extreme grief at her death, and his gradual sublimation of earthly love into divine love. Though in his worshipful attitude toward Beatrice Dante at first made ample use of medieval love conventions prevalent, for instance, in Provençal troubadour poetry and, later, in the emotional technique of the Petrarchists, the intense purity and selflessness of his love gradually evolved into religious adoration in which Beatrice, especially after her death, increasingly became saintly, the incarnation not of womanhood, but of theology and divine revelation. The later impact of his secular studies and of works like Boethius' *De consolazione philosophiae*, leading to moments of despairing doubt when he oscillated between the symbolism of Beatrice and secular pride and dissatisfaction, can best be seen in his second work, the *Convivio*, in which he subjected four of his odes to a philosophical and allegorical interpretation in the best manner of medieval scholasticism. If completed, the *Convivio* might have become an encyclopedic masterpiece of medieval philosophy and morality; as it is, it is important as a first example of Italian scientific and philosophical prose. It is idle to speculate where exactly in the *Vita nuova* and the *Convivio* Beatrice is a woman of angelic purity and where she has become a philosophical or theological abstraction, for in either case his relationship with a girl he had hardly met and rarely seen is not the tale of an ordinary love, but of an exaltation of goodness and faith to which Dante, in spite of all inner conflicts, was bound to return again and again. Indeed, at the very end of the *Vita nuova* he had a vision of the Beyond which he was not immediately able to write down and in which Beatrice, who had led him out of the sterility of secular philosophy, was to be the very center, and it took him years of further study and meditation before he was able to describe his vision in the *Divine Comedy*, and to write of Beatrice "what was never said of any woman."

Of Dante's Latin works *De Monarchia* was the most important for its time, though it is generally neglected today. It demonstrated the divine necessity of the empire and clearly postu-

lated the division of church and state, thereby restricting the pope to a supremacy only in spiritual matters. The great conflict between Guelphs and Ghibellines which had become exacerbated rather than assuaged since the drama at Canossa in 1077, received through this work of Dante a powerful impetus in the direction of Ghibellinism. A further indication of Dante's critical attitude toward excessive ecclesiastical claims, all the more wrathful because he was one of the staunchest sons of the Church of Rome, can be seen in his many derogatory remarks about the alleged Donation of Constantine and, long before Lorenzo Valla, the exposé of this hoax, he began to reject the claims of the church over the state, and of the pope over the emperor. Closely connected with *De Monarchia* and its antipapal and anti-Florentine tenor are the following *Epistles*: "To the Princess and Lords of Italy" (1310), in which he pleaded for harmonious unity under Emperor Henry VII; "To the Florentines" ("Dante Alighieri, the Florentine innocently exiled, sends greetings to the infamous native Florentines"); "To Emperor Henry VII" (1311) in which he ardently welcomed and advised the German monarch who, however, traveled to his coronation in Rome (1312) without visiting Florence, the "hydra." Concerned with literature rather than with politics is another letter, addressed to Can Grande della Scala, in which Dante gave much valuable information about the background and the symbolism of the *Divina Commedia*—and especially his fragmentary treatise *De vulgari eloquentia*, in which, in contrast with the preference of future humanists for Latin, he defended the use of the vernacular Italian tongue for literary purposes, and provided one of the earliest philological studies of language.

The question of whether Dante belongs to the Middle Ages or to the Renaissance is difficult to answer, for this Janus-faced poet at times seems an embodiment of both these epochs. In many ways he had nothing at all to do with the Renaissance; he summed up the Middle Ages rather than announced the dawn of a new age. His *Divina Commedia* is a thoroughly Christian didactic epic which has often been called one of the last great Gothic cathedrals. Among his contemporaries, instead of being far ahead of his time, he was in reality far behind it, a dreamer of vanished utopias whose visions and hopes of a Pan-Christian European empire became increasingly obsolete as time passed on. A deep chasm separated Dante, the austere Christian and valiant battler, from other 14th century poets like Boccaccio, who made his women carnal rather than spiritual, and who opposed to Dante's Christian man of the past, the worldly man of the future. Yet though the poets of the Renaissance were reluctant to concern themselves with this austere ascetic and his frightful visions of hell-fire and damnation, they should have realized that he was very much a part of their modern age, too. A European Renaissance so deeply indebted to Italy could not possibly justify its overlooking Italy's greatest poet, and a new age so much given to the polish and melodiousness of poetic diction could not possibly ignore the many classical features of Dante's style. While French, English, or German were standardized at a much later date and while foreign medieval authors like Jean de Meung, Wolfram von Eschenbach, and Geoffrey Chaucer wrote in a language that is all but incomprehensible to the casual modern reader,

Dante created a tool of expression that was clear, concise, and modern in every way, and he succeeded in clothing his fantastic visions of the Beyond in a strictly symmetrical poetical pattern and in a marvelously concrete plasticity of language that should have found the fullhearted approval of all classicists. And, finally, Dante belongs to the modern age because of his tremendous vitality, his *virtù*. He could love and hate, fight and despise as violently as any *condottiere* of the 16th century; instead of being a somewhat pale representative of the orthodox Middle Ages, he was vigorous, full-bodied, of untamable energy, truly modern. No Leonardo da Vinci could be more versatile than he, for he was a soldier, a poet, a courtier, a diplomat, a politician, and a lover. There was no trace of medieval self-effacement in him; instead we behold in him a magnificent arrogance unequalled by any Medici or Borgia, the pride and haughtiness of a man who was sure of himself and who was consequently alone in his life and in his struggles. However, with this virility, contemptuousness, and lawlessness, Dante combined a severe spiritual discipline and an austere Christian outlook on life. It was this rather medieval aspect of his *virtù* which separated him from the unbridled and self-indulgent *virtù* of the Renaissance.

More trustworthy than Boccaccio, the author of *Vita di Dante* and *Commento sopra la (Divina) Commedia* which broke off with *Inferno*, XVII, is the biographical chapter on Dante contained in the *Cronaca* of Giovanni Villani, a contemporary and a neighbor of Dante's, and the 15th century account of Dante's life written by Leonardo Bruni d'Arezzo. From Petrarch and the rise of humanism on, however, Dante fell into gradual disrepute, partly, no doubt, because he had written in the local vernacular instead of the fashionable Latin tongue. This unfavorable verdict on Dante was intensified in the age of the Counter Reformation, with its *Index Librorum Prohibitorum* and expurgated editions, and orthodox scruples multiplied against the man who in his writing had put seven popes into hell and had been so emphatic in his support of Ghibellinism. But Italian admirers of Dante in the 16th century included Michelangelo Buonarroti and Machiavelli, for Dante was the very fountainhead of Italian national hopes and aspirations, and it stands to reason that he was hailed by all patriots, from Machiavelli to Giuseppe Mazzini and Giosuè Carducci who, like him, were dreaming of a *risorgimento*, a liberation of Italy from the yoke of foreign occupation. A third group of enemies to darken the prestige of Dante, after the humanists and the Jesuits, were the later Italian disciples of French classicism who, like Saverio Bettinelli in his notorious *Lettere virgiliane* (1758), followed Voltaire in scorning such Gothic literature as repulsive to man's sense of verisimilitude. But only a few years later, with ardent defenders like Gaspare Gozzi, Giuseppe Baretti and Vittorio Alfieri, Dante was forever safely enshrined as the *sommo vate* (greatest poet) of Italian literature.

Though Chaucer in 14th century England was the first great foreigner to emulate Dante, employing the visionary form (*The House of Fame*), adopting a particular theme (the story of Ugolino in *The Monk's Tale*), and using the *terza rima* for the first time in English (*Complaint to his Lady*), and though Margaret of Navarre in 16th century France was deeply influenced by Dante's

religious earnestness (*Les Prisons, Le Navire*), it was in Spain, Germany, and Switzerland that his impact evoked the most interesting early echoes. Spanish poets of the 15th century, both Catalan (Bernat Metge, Fra Hugo Bernat de Rocaberti) and Castilian (Micer Imperial, the marqués de Santillana, Juan de Mena, Juan López de Padilla) enthusiastically emulated him. But when the Inquisition began to object to him and the Protestants began to regard him as a forerunner of Martin Luther, Dante's fame in Spain, except for Francisco Gómez de Quevedo's *Sueños* (1627), was almost completely obliterated for centuries to come. The German and Swiss Protestants, though hardly knowing Dante as a poet, certainly knew of him as a theologian, as the author of *De Monarchia*, and as the great Ghibelline, and in 1559 there was printed, in Basel, not only the *editio princeps* of *De Monarchia*, a book forbidden in Catholic lands until 1870, but also its first translation into a modern vernacular tongue, German. Protestants went so far in hailing him as a forerunner of Luther (to the extent, for instance, of declaring the mysterious Veltro of *Inferno*, l. 101 to be an anagram for I. vtero) that it took the great prestige of Robert Cardinal Bellarmine (*De controversiis christianae fidei*, 1592, published in 1623) to re-establish Dante as a loyal member of the Roman Catholic Church, which of course he was.

In the period from Nicolas Boileau to Voltaire, the reputation of Dante in Europe reached its nadir. The one great exception is John Milton, whose life, character, and political visions have often been shown to display striking parallels with Dante's, and whose *Paradise Lost*, shows actual influences especially from the last canticle of the *Divina Commedia*. With the dawn of preromanticism, Dante together with Homer and Shakespeare, gradually became one of the great gods of the new school not only in England, where Henry Francis Cary, Lord Byron, Percy Bysshe Shelley, Leigh Hunt, Thomas Carlyle, Alfred, Lord Tennyson, and Robert Browning represent peaks in the history of the increasing appreciation of Dante, but also in Germany, France, and the United States. German romantics became the leaders in the Dantomania of the last 150 years, with German poets (Heinrich Wilhelm von Gerstenberg, Goethe, Karl Leberecht Immermann, Paul Heyse), translators (A. W. Schlegel, Philalethes), philosophers (Friedrich von Schelling, Georg Hegel), and scholars (Karl Witte, Ludwig Blanc, Theodor Paur, Franz Wegele), becoming particularly significant. French reappraisals of Dante began with Comte de Rivarol, René de Chateaubriand, Alphonse de Lamartine, Antony Deschamps, Antoine Ozanam, Jean Jacques Ampère, and Felicité Robert de Lamennais, while the beautiful essays or translations by James Russell Lowell, Henry W. Longfellow, and Charles Eliot Norton in America indicate that the intellectual leaders of New England, despite the chasm of space, time, and religious differences, felt a great affinity with the austere and reserved Florentine. Romanticists like Byron, Mme. de Staël, Victor Hugo, and Heinrich Heine liked to believe that they resembled him in their voluntary exile from their homelands and in their bitter scorn of the tyranny of despots and of the fickleness of the masses. Musical composers (Franz Liszt, Richard Wagner), and especially painters from Sir Joshua Reynolds, William Blake, and John Flax-

man through Joseph Anton Koch, Peter Cornelius, and Anselm Feuerbach to Jean Auguste Dominique Ingres, Eugène Delacroix, and Gustave Doré continued to use him as an inspiring model. In our own age of Stefan George and T. S. Eliot, Dante has maintained his unchallenged role as one of the great spiritual forces of modern humanity. As the British prime minister William Gladstone put it so succinctly: "The reading of Dante is not merely a pleasure, a *tour de force*, or a lesson; it is a vigorous discipline for the heart, the intellect, the whole man. In the school of Dante I have learnt a great part of that mental provision (however insignificant it may be) which has served me to make the journey of life up to the term of nearly seventy-three years. And I should like to . . . say that he who labours for Dante, labours to serve Italy, Christianity, the world." See also DIVINE COMEDY, THE.

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WERNER P. FRIEDERICH,
Professor of German and Comparative Literature
University of North Carolina.

DANTON, dan-ton', **Georges Jacques**, French revolutionist; b. Arcis-sur-Aube, France, Oct. 28, 1759; d. Paris, April 5, 1794. He was the son of a prosecuting attorney of the bailiwick of Arcis-sur-Aube. Adopting the paternal profession of the law, he became at a youthful age an advocate practicing before the king's council in a time of national crisis (1785–1791). One of the leaders of the Revolution, he played a vitally important part in its first years. Striking in external appearance, he was of colossal height with an athletic frame and large, harsh features. His voice shook the dome of the chamber of the assembly, his eloquence was vehement, and his imagination was as gigantic as his person. These qualities contributed to the spread of his influence and he became one of the founders of the club of the Cordeliers. After the capture of Louis XVI at Varennes (June 21, 1791), he took the lead in the meeting at the Champ-de-Mars which demanded the dethronement of the king. He is said to have had a share in organizing and conducting the attack on the Tuileries on Aug. 10, 1792; a few days afterward he was appointed minister of justice. He also became a member of the provisional executive council and usurped the appointment of officers in the army and departments. Money flowed from all sides into the hands of the minister and was as profusely squandered on his tools and partisans. He endeavored by the terrors of proscription to annihilate all hope of resistance on the part of the Royalists. The invasion of Champagne by the Prussians on September 2 spread consternation throughout the capital. The ministers, the most distinguished deputies, and even Robespierre himself now relied on Danton, and never was his splendid courage and his characteristic audacity more strik-

ingly manifested. He assumed the administration of the state and prepared measures of defense, called on all Frenchmen capable of bearing arms to march against the enemy, and prevented the removal of the assembly beyond the Loire. The close of his celebrated speech has been often quoted, "Le tocsin qu'on va sonner n'est point un signal d'alarme, c'est la charge sur les ennemis de la patrie. Pour les vaincre, il nous faut de l'audace, encore de l'audace, toujours de l'audace, et la France est sauvée!" From this time forward he was hated by Robespierre, who could never pardon the superiority which Danton had shown on that occasion. He voted for capital punishment being inflicted on all returning Royalists and undertook the defense of religious worship. The contest between the Girondists and the Montagnards (qq.v.) daily assumed a more serious aspect, and Danton, while he feared the consequences of these discussions, allowed matters to drift. He wished to overthrow the despotism of Robespierre, and the crafty Robespierre endeavored to undermine him in order to get rid of a dangerous rival. Louis A. L. de St. Just denounced him to the Committee of Public Safety, and Danton was arrested on the night of March 31, 1794, together with those who were called his accomplices. Being thrown into prison in Luxembourg he maintained the appearance of serenity. When transferred into the Conciergerie his countenance became dark and he appeared mortified at having been the dupe of Robespierre. All his discourses were a strange mixture of sorrow and pride. At his trial, on the formal question as to his name and residence being put, he answered, with perfect composure, "I am Danton, sufficiently known in the Revolution; I shall soon pass to nothingness, but my name will live in the Pantheon of history." So powerful and defiant were his speeches in reply to his accusers that St. Just got a resolution passed by the revolutionary tribunal that the mouths of men who had "insulted justice" should be shut, and on April 5 he mounted the fatal car with courage his head elevated, his look commanding and full of pride. Before ascending the scaffold he was for a moment softened. "Oh my wife, my dear wife! shall I never see you again?" he exclaimed, but checked himself hastily and by calling out "Danton, no weakness!" ascended the scaffold.

DANUBE, dăn'üb (Ger. DONAU; Hung. DUNA; Rumanian DUNĂREA; ancient DANUBIUS or ISTER), the second river of Europe, rising in the rugged Black Forest of southwestern Germany, flows from west to east for 1,760 miles to empty into the Black Sea. Its drainage basin of 347,000 square miles includes portions of seven European countries, Germany, Austria, Czechoslovakia, Hungary, Yugoslavia, Rumania, and Bulgaria.

Two small streams, the Brege and Brigach, descend the slopes of the Schwarzwald in Baden from an elevation of 2,850 feet to unite as its head waters.

Above the city of Bratislava the Danube is a mountain stream flanked by wooded heights, many crowned by ruined castles, the strongholds of robber barons in the Middle Ages.

The mid course extends from Bratislava to the so-called Iron Gates, a few miles below Orșova in Rumania. Here the current swirls

through a narrowed passageway some two miles long, formerly impeded by rocks and flanked by bluff highlands.

In its final course the river winds through level lowlands to the delta. Here the current divides into three major channels and several minor ones, separated by low lying marshy or wooded islets which are gradually building up from an annual silt deposit which exceeds 100,000,000 tons. For centuries, the inhabitants have conducted a picturesque sturgeon fishery with an important export of caviar.

The basin of the Danube includes four minor basins. The first, 150 miles long and 125 broad, lies some 1,640 feet above sea level and is surrounded by mountains. Comprising the former principality of Hohenzollern, much of Bavaria and Württemberg, it is the most fertile and populous area. Here river commerce is swelled by a canal connection with the Rhine.

The second basin centers about the city of Vienna. Irregular in form and surrounded by mountains, it presents many charming views. The soil is rich in minerals and the climate one of the best in Europe.

The third basin comprises much of Hungary and Transylvania. An extensive plain only 394 feet above sea level, it is crossed by several tributary rivers, the Sava, Drava, Morava, and others. Here, along water courses, sandy stretches, saline wastes and stagnant pools merge into marshes which cover more than 3,000 square miles.

Below Moldavia the river flows for some 60 miles over rapids and shallows in a passageway eroded through the hills which united the Carpathians with offshoot ranges from the Alps.

The fourth basin comprises much territory in Rumania, Bulgaria, and Bessarabia. Along the river banks the country is flat and marshy, while the drier hinterland is rimmed with mountains.

Among the cities which have grown up along the Danube are Ulm in Württemberg, the scene of one of Napoleon's many triumphs, Vienna, once the capital of the Holy Roman Empire, Ratisbon (Regensburg), on whose cliffs the Germans built their Walhalla, or Hall of Fame, Budapest (Buda-Pesth), capital of Hungary, Belgrade (Beograd), chief city of Yugoslavia, Nikopol (Nicolopolis) in Bulgaria, and Galați (Galatz) in Rumania.

The latter city, though 90 miles from the sea, is the ocean port of the Danube Valley, outranking Sulina harbor on the Black Sea. In the delta area flood waters sometimes rise 30 feet, while in time of drought sand bars emerge. Yet the outflow is comparatively steady with an average discharge of more than 300,000 cubic feet a second.

Disastrous floods have occasionally been caused by ice. In severe winters long stretches of the river are frozen. The ice jam of 1838 created a flood which swept away 4,000 buildings in Budapest and drowned over a thousand persons.

The importance of the Danube as a commercial highway was recognized by the Romans whose markings on the cliffs record how they dragged craft upstream against the current. Most of the obstructions in the Iron Gates were blasted out in the years 1890-1896 and the channel deepened. Now river steamers ascend all the way to Austria while barges are towed as far as Ulm. The Danube has 60 navigable tributaries.

Rocks and shoals, however, have proved lesser impediments than national boundaries. As far back as 1368 an attempt was made to reconcile conflicting interests. In the period from 1699 to 1883 no fewer than 28 treaties were drawn up to insure the commercial utilization of the Danube. In 1856 a Danube Commission was established with representatives from all bordering countries. Plans were elaborated to maintain a 24-foot channel from the sea. The most recent agreement entered into by the United States, Great Britain, and Russia confirmed the "freedom of the river" only to have the lower valley sealed off by the Iron Curtain.

The Danube is rich in historic association. Known to the Greeks as the Ister, Herodotus called it "the greatest of rivers." In general it divided the Mediterranean world from the barbarian hinterland. Both the Persian Darius and Alexander the Great crossed the Danube bent upon conquest, but withdrew from a wilderness inhabited only by wandering Scythians. Known to the Romans as the Danubius, it remained a boundary of empire until Trajan incorporated much territory beyond as the province of Dacia, the nucleus of modern Rumania.

With its source in the Occident, its mouth opening upon the Orient, the Danube Valley has proved a highway for invading armies. From the west came the Romans, Charlemagne, the Crusaders, and Napoleon. But more destructive were the hordes of Asia. The Huns, under Attila, beaten back from Gaul settled the broad plains of Hungary. Other incursions involved the Ostrogoths, the Avars, and the Bulgarians. In 1241 the Mongols, having annihilated the Army of Bela IV of Hungary, swept to the shores of the Adriatic, while after the fall of Constantinople the Turks twice besieged Vienna and for a long time threatened the peace of Europe. FERDINAND LANE.

DANUBE NAVIGATION COMMISSION, an international commission, constituted in 1856, when at the Peace of Paris the navigation of the river was declared free to all nations. It was composed of delegates of all the great powers, to whom a representative of Rumania was added in 1878. It was appointed on the express condition that it should dissolve in 1858, but such was its usefulness that it was informally continued till 1866, when the Conference of Paris formally prolonged its powers for five years. In 1871 the Conference of London continued the commission for 12 years, and in 1883 a second London conference extended its existence for 21 years. The commission's jurisdiction was extended at the Congress of Berlin in 1878 as far as Galati (Galatz), and afterward to the Iron Gate; and the river was closed to ships of war. The commission exercised almost sovereign power, possessing its own flag, uniform, and revenue, and raising loans, making laws, and maintaining its own small army of police. In 1919, by the Treaty of Versailles which followed World War I, the Danube was internationalized, the postwar commission operating under a statute signed in Paris in 1921. Germany was admitted to membership in the commission in 1939, thereafter dominating its policies until her downfall in World War II.

DANVERS, town, Massachusetts, in Essex County, 16 miles northeast of Boston, served by

the Boston and Maine Railroad. It is an old residential town in a truck farming area raising carrots, parsnips, cabbages, and squash; and has manufactures of baby shoes, leather, crayons, toys, lamps, chemicals, and paper boxes. Here are a state hospital for the insane; Essex County Agricultural School; a Peabody Institute, founded by George Peabody; and St. John's Preparatory School (Catholic). Settlers came here from Salem in 1636; the town was first called Salem Village and remained a part of Salem until 1756. Salem Village parish was the center of the witchcraft excitement, about 1692, during which many of the inhabitants were arrested and some hanged. The present town was incorporated in 1757. Israel Putnam and Grenville Mellen Dodge (qq.v) were born here; the poet John Greenleaf Whittier lived his last years here at "Oak Knoll"; and Nathaniel Hawthorne frequented nearby Mount Burnett. Among the old dwellings are: the Page House (1754), the Samuel Fowler House (1809), and the Rebecca Nurse House (1636). Pop. (1950) 15,720.

DANVILLE, city, Illinois, and Vermilion County seat, on the Vermilion River, 33 miles east of Champaign; it is served by the Chicago and Eastern Illinois, the Wabash, the New York Central, the Cleveland, Chicago, Cincinnati and St. Louis, and the Illinois Terminal railroads. Its chief industry is coal mining, which is carried on extensively on the bluffs of the river. There is also a large zinc smelter, brick plant, locomotive shop, and meat-packing plant. Among manufactures are shoes, overalls, paper boxes, butter, candy, flour, starch, corn syrup, agricultural implements, and mining machinery. Great dairy and stock farms are in the environs; and the first cornstalk paper pulp mill was located at Danville.

Two traders at a nearby salt works, Guy W. Smith and Dan Beckwith, donated 100 acres for a county seat in 1827; and from the latter the new town received its name. Danville was incorporated in 1869. The First National Bank is on the site of the Barnum Building where Ward Hill Lamon and Abraham Lincoln maintained a law office from 1852 to 1859. Artificial Lake Vermilion, 2½ miles north, is a community summer resort. Danville has a commission government. Pop. (1940) 36,919; (1950) 37,864.

DANVILLE, town, Indiana, and Hendricks County seat, 20 miles west of Indianapolis, served by the Cleveland, Chicago, Cincinnati and St. Louis Railroad. Feed milling and woodworking are the principal industrial occupations. It has a board of town trustees; city-owned water system; and public library. Canterbury College, a coeducational institution, was established here in 1946. Pop. (1940) 2,093; (1950) 2,802.

DANVILLE, city, Kentucky, and Boyle County seat, on Dick's River, 32 miles southwest of Lexington, served by the Southern and the Louisville and Nashville Railroads. It is a tobacco, hemp, and livestock center, and manufactures include clothing and furniture. The water supply system, municipally owned, draws upon Herrington Lake. The city has a public library, and is the site of Centre College, and the Kentucky School for the Deaf. Danville was settled in 1775 and became a strong political center; nine historic conventions were held in the city. Here the separation from Virginia was discussed and the

constitution of the state drafted. Danville was incorporated in 1789. It has the first post-office building west of the Alleghenies. Pop. (1930) 6,729; (1940) 6,734; (1950) 8,686.

DANVILLE, Pa., borough and Montour County seat, on the north branch of the Susquehanna River 30 miles southeast of Williamsport; it is served by the Pennsylvania, the Delaware, Lackawanna and Western, and the Philadelphia and Reading railroads. Danville is located in a region abounding in iron ore. In 1840 the Montour Iron Works was established here; in 1845 it rolled some of the first iron rails for railroads. The chief industries of Danville are iron and steel works, and the manufacture of stoves and textiles. In addition to the public schools there is the Slovak Girls' Academy, maintained by the Sisterhood of Saints Cyril and Methodius. The city, first called Dan's Town, was named for Daniel Montgomery, son of Col. William Montgomery who built a home here in 1777. Platted in 1792, Danville was incorporated in 1849. It has burgess and council. Pop. (1950) 6,994.

DANVILLE, Va., city of Pittsylvania County, on the Dan River 150 miles southwest of Richmond, is served by the Southern and the Danville and Western railroads. The city is located in the Piedmont section, and the descent of the river furnishes power for the mills in which textiles and flour are made. Danville is in tobacco country, and is one of the largest bright-leaf markets. Danville's textile industry is also extensive. Further industrial production includes paint, brick, lumber millwork, castings, harness, and proprietary medicines. The city administration centers in a mayor and nine councilmen, elected at large. The city owns and operates the water, gas, and electric plants. Hydroelectric power is generated by a three-million-dollar plant completed in the late 1930's.

Danville has a free public library with more than 20,000 volumes, and a Confederate museum. It has many fine churches, and three hospitals, including one for Negroes; a municipal auditorium; a fine federal building; an impressive municipal building; a nine-story Masonic temple, and modern factories. It is the seat of two junior colleges for girls, Averett and Stratford colleges.

The city was founded in 1793 and chartered in 1833. For a short time during the last days of the Southern Confederacy it was the seat of government. One of its landmarks is the Confederate Memorial Mansion, "The Last Capitol of the Confederacy." It was used in that capacity after the fall of Richmond in 1865. Pop. (1930) 22,247; (1940) 32,749; (1950) 35,066.

DANZIG, dăn'zīg, or **GDANSK**, gedăn'yesk, German and Polish names, respectively, for a city and commercial seaport in the Gdansk department of northern Poland. It is within the Gulf of Danzig, on a western delta arm of the Vistula at its junction with the Mottlau, several branches of which traverse the city. Fortifications on the north and west side of Danzig gave place in 1895-1896 to streets and public gardens, those on the east and south being retained. The city, which is entered by four gates, has nine suburbs and is divided into five parts—the Old, New, and Low town, the Speicher (granaries), an island, and Langgarten. The last is the more

modern part of the city, and is regular and well built. The principal edifice is Saint Mary's Church, begun in 1343 but not finished until 1503. One of the world's largest Protestant churches, it is 360 feet long by 142 feet broad, and its vaulted roof, 98 feet above the pavement, is supported by 26 slender brick columns. It possesses a fine brass font and a curious astronomical clock, which has long ceased to move, but its chief attraction is a painting of the *Last Judgment* probably by Hans Memling (Memlinc) although formerly attributed to Jan van Eyck. Other buildings and institutions deserving of notice include the town hall, a Gothic structure with a graceful spire; Saint Catherine's Church, the oldest in Danzig; the exchange, an imposing Gothic edifice, built in 1379 within the Artushof (Merchants' Guild); and a Franciscan monastery now containing a picture gallery and numerous antiques. The city is well equipped with educational and charitable institutions. There are important shipyards, several sawmills, a car factory, breweries, distilleries, fertilizer plant, bolt and nut factory, and plants producing amber goods, cigarettes, bricks, and furniture. Railroads link Danzig with Germany and other parts of Poland, and there are excellent steamship and air connections. The commercial language was German prior to World War II. The actual port of Danzig is Neufahrwasser, about 5 miles north of the city at the mouth of the Vistula, and connected with it by an artificial channel. By dredging and otherwise, various obstructions to navigation have been removed and vessels of large size come up close to the city. The seaport has a considerable shipping business, principally with Poland, the chief exports being lumber, grain, coal, cement, and iron and steel products. Foodstuffs and raw materials are the major imports.

The history of Danzig reaches back to times of historical obscurity. As early as 970 there was a town here, and in 997 it bore the Polish name of Gdansk. It became subject to the dukes of Pomerania in the 13th century, and after them it was held by the Poles, Brandenburg, and Denmark. From 1309 till 1454 it was in the hands of the Teutonic Knights (q.v.), under whose sway it enjoyed considerable prosperity. In 1358 Danzig joined the Hanseatic League (q.v.), and with a monopoly of the Polish foreign trade it grew to become one of the four principal cities of the league. It fell to the Poles in 1454; and after conclusion of the Second Treaty of Thorn, in 1466, it became a free city under the protection of Poland. Thereafter it endured many vicissitudes of fortune. The Russians and Saxons captured the city after a siege in 1734, and its trade declined greatly following its separation from Poland at the kingdom's first partition in 1772. At the second partition of Poland, in 1793, Danzig, with surrounding territory, was ceded to Prussia. In 1807, during the Napoleonic Wars, it was captured by Marshal François Joseph Lefebvre, who was created duke of Danzig, and the city remained under French administration (with disastrous effects upon its trade) until 1814 when, with Napoleon's downfall, it was restored to Prussia.

Danzig was capital of West Prussia, a province of the German Empire, down to the end of World War I when, with establishment of the republic of Poland, the Paris Peace Conference was confronted with Polish demands for cession

of the city and its seaport. Since 95 per cent of the population at that period was German, it was provided by Article 102 of the Treaty of Versailles (1919) that the FREE CITY OF DANZIG be recreated as a state, placing it under the protection of the League of Nations. With surrounding territory, the area of the free city totaled 754 square miles, and the population numbered 407,517 in 1929; besides Danzig and its seaport, communities included the seaside resort of Sopot and the small towns of Nowy Staw (Neuteich) and Nowy Dwor Gdanski (Tiegenhof). The free city was in customs union with Poland, which also conducted its foreign relations. Executive power was vested in a high commissioner appointed by the League of Nations, and legislative authority was exercised by a 120-member Volks-tag, which elected a Senate. Although Danzig thus provided a Polish outlet to the sea there was continuous friction with Poland; and as a consequence, after the free city's National Socialist Party (allied to that of Germany) secured a sweeping victory in the 1933 election to the Volks-tag, the republic proceeded to expand the facilities of the rival seaport of Gdynia (q.v.), within Polish territory. Thereafter the Nazis virtually controlled the free city, and Adolf Hitler's demand in 1939 that Danzig must again return to Germany provoked hostilities with Poland and precipitated World War II. The Allies recovered possession of Danzig in 1945 and assigned it to Poland, which restored to the city its ancient name of Gdansk (q.v.). Pop. (1948 est.) 164,000.

DAPHNE, dăf'nê, in mythology, the daughter of the river-god Peneus. See LAUREL IN ART AND SYMBOLISM.

DAPHNE, a famous grove near Antioch (now Antakya, Turkey), planted in 300 B.C. by Seleucus Nicator, who erected a temple there and dedicated it to Apollo and Diana. It was a place of pagan pilgrimage noted for its license, until the spread of Christianity caused its abandonment. Julian sought to revive its splendors, but the temple was burned and the site was soon after abandoned. Ancient remains are few. A graphic description of this grove is given in *Ben Hur* (1880) by Lew Wallace. For Daphne in Egypt see TAPPHANES.

DAPHNE, in botany, a genus of plants belonging to the Thymelaeaceae or mezereon family. The genus has about 80 species, natives of Europe and Asia. The single species in the United States is the spurge or lady laurel, found in northern New England and New York as a fugitive from cultivation. The berries are poisonous and the flowers of many are very fragrant. These plants are common in temperate climates in Europe and Asia, and are valuable commercially. From the bast of some species fibers are obtained, and most of the paper used in central Asia is made from some species of the daphne. The inner bark of *D. lagetta*, when cut into thin pieces after maceration, assumes a beautiful net-like appearance, whence it has received the name of lacebark.

DAPHNEPHORIA, dăf-nê-fô'rî-ă, in the religion of ancient Greece, one of the most ancient and important of the festivals; it was observed at Thebes every eight years in honor of Ap

DAPHNIA, dăf'nî-ă, in zoology, a minute entomostracan crustacean of somewhat globular shape, which swarms in millions in ponds and ditches, and is important as a food for tadpoles, fish fry, and other small aquatic creatures.

DAPHNIN, dăf'nin, in chemistry, a glucoside having the formula $C_{15}H_{16}O_8 + 2H_2O$, and occurring in the bark and blossoms of certain species of plants belonging to the genus *Daphne* (q.v.). It is slightly soluble in cold water, from which it crystallizes in rectangular prisms containing two molecules of water. It is insoluble in ether, but readily dissolves in boiling alcohol. It reduces Fehling's solution slowly, and by the action of emulsin or of dilute acids it is converted into glucose and a substance called daphnetin, or di-oxy-coumarin.

DAPHNIS, dăf'nîs, in Greek mythology, the son of Hermes (Mercury) by a nymph, educated among the nymphs, and celebrated in the Sicilian traditions as the author of bucolic poetry, and also as a performer on the shepherd's pipe. He pastured his flocks upon Mount Aetna. The nymph Echenais, who loved the youth, threatened him with blindness if he should love another; but being intoxicated with wine by the daughter of a Sicilian prince, he forgot the warning, and thus brought upon himself the threatened punishment. Some say that he died of grief; others that the nymph transformed him into a stone. All the nymphs bewailed his death, and Hermes raised him to the heavens. On the spot where he died flowed a fountain, at which the Sicilians afterward performed yearly sacrifices.

DAPHNIS AND CHLOE, klô'ê, a Greek prose pastoral romance, attributed to the sophist Longus, about whom nothing is known; it may have been written in the 2d or early in the 3d century A.D. Despite many marks of decadence, it is by far the most delightful of the Greek romances. Daphnis, a boy, and Chloë, a girl, infants exposed by their respective parents, are found and adopted by shepherds; and their fortunes are followed through the years of their love for each other, which grows with the ripening seasons—to the happy end, when they are reclaimed by their parents, and married. The charm of the story lies in the children's naive courtship and in the rich and exquisite scenery of their rural life, both the action and the setting being such as a sophisticated urban imagination frames for idealized dwellers in the Golden Age. The book appeals to every sense in a succession of lovely idyls.

It pleased the Renaissance, and has pleased the centuries since. The *editio princeps* was printed in 1598 (Florence); but in 1559 Jacques Amyot had already translated *Daphnis and Chloë* into a French classic (often reprinted), from which in 1587 Angel Day made a wretched English paraphrase (reprinted London 1890 with introduction by Joseph Jacobs). Both versions gave Robert Greene material for his *Pandosto* (1588), which in turn became the chief source of Shakespeare's *The Winter's Tale* (1611); Shakespeare seems to have taken several details directly from Day. How much Allan Ramsay's *The Gentle Shepherd* (1725) owes to *Daphnis and Chloë* is not certain; its theme is much the same, as is that of Bernardin de Saint-Pierre's

Paul et Virginie (1789). An enlarged recension of Amyot's translation was published in 1810 by Paul Louis Courier, who in 1807 had found in a Florentine manuscript—and in 1809 had transcribed and then blotted—a portion missing from all other manuscripts. Of Pierre-Paul Prud'hon's admirable illustrations three appeared in the French version published by Didot and one other in Annibal Caro's Italian version, published by Firmin Renouard, both Paris 1800. An English translation by George Thornley (first published in 1657) was revised and augmented by J. M. Edmonds, *Loeb Classical Library* (New York 1916).

DAPITAN, dā-pē'tān, Philippines, a town at the northwestern extremity of the island of Mindanao, Zamboanga Province, on a bay of the same name. It serves a rich agricultural district, the products of which are exported from the port. Pop. 28,295.

DARAB, dā-rāb', Iran, a small town of Fars Province, 140 miles southeast of Shiraz. Situated at an elevation of some 4,000 feet in the midst of large groves of citrus trees, it lies on the route taken by desert caravans for many years between Shiraz and Bandar Abbas. The place is of interest to archaeologists for the vertical rock in the neighborhood on which has been sculptured in bas relief a memorial depicting the victory of Shapur I over the Roman emperor Valerian at Edessa in 259 A.D. According to tradition, the town was named for the father of Darius III. Pop. (1947 est.) 7,554.

DAR-EL-BEIDA, Arabic name for the Moroccan seaport of Casablanca (q.v.)

DAR ES SALAAM, dār'ēs-sā-lam' (Arabic haven of peace), East Africa, capital and chief seaport of Tanganyika Territory, 48 miles south of the island of Zanzibar. It has an excellent harbor approached by a narrow channel. The town is well laid out, with handsome modern buildings and broad, tree-shaded streets. There is an excellent botanical garden on the outskirts. Through the village which formerly occupied the site of Dar es Salaam thousands of slaves and tons of ivory from the interior of central Africa once poured, en route to Zanzibar. Sayyed Majid, sultan of Zanzibar, commenced the erection of a palace there in 1862, foundation of the town dating from that period. At the sultan's death in 1871 the palace remained uncompleted, but new impetus was given to the town in 1887, when a trading station was established there by Karl Peters (q.v.) on behalf of the German Colonization Society. A German garrison arrived two years later, and in 1891 Dar es Salaam became the capital of the German chartered company at that period administering the government of German East Africa. In 1902 construction began of a railway from the port into the interior, and thenceforward the town rapidly grew. Early in World War I the port was shelled by British warships, and on Sept. 3, 1916, Dar es Salaam was surrendered; thereafter it was the base of British military operations in the East African campaign. Pop. (1947 est.) 68,700.

DARBHANGA, dūr-būng'gā, India, town in Bihar Province, 78 miles northeast of Patna, on

the Little Baghmati River. Most striking building is the palace of the maharajah of Darbhanga, head of the Maithil Brahmins, whose authority extends over a considerable area beyond the district of Darbhanga. The district consists of a low-lying, fertile plain, 3,348 square miles in area, watered by many streams; linseed, rice, sugar, and tobacco are the principal crops. Pop. 1941 (town) 69,203.

D'ARBLAY, Madame, married name of FANNY (FRANCES) BURNEY (q.v.).

DARBOUX, dār'bōō', Jean Gaston, French mathematician: b. Nîmes, Aug. 13, 1842; d. Paris Feb. 23, 1917. He taught at the Ecole Normale Paris, where he had previously been a student, and after holding posts at the Collège de France and the Lycée Louis le Grand he returned there in 1872 as maître de conférences. In 1873 he joined the faculty of the Sorbonne, and from 1880 till 1889 he occupied the chair of higher geometry at that institution. He was appointed perpetual secretary of the Academy of Science in 1890. An outstanding geometrician, he wrote extensively on infinitesimal geometry, orthogonal surfaces, the approximation to functions of very large numbers, and on discontinuous functions.

DARBOY, dār-bwā', Georges, archbishop of Paris: b. Fays-Billot, Haute Marne, Jan. 16, 1813; d. Paris, May 24, 1871. Admitted to the priesthood in 1836, he began regular parish work, but in 1839 he joined the faculty of the ecclesiastical seminary of Langres, teaching first philosophy and later dogmatic theology. Removing to Paris in 1846, he was for a while attached to the College of Henry IV, and in 1854 he was appointed vicar general of the archbishop of Paris. In 1859 he was consecrated bishop of Nancy, and in 1863 was appointed successor to Archbishop Sibour of Paris, who had been slain by an assassin. He was a strenuous upholder of episcopal independence, and became involved with Rome through his efforts to suppress the jurisdiction of the Jesuits and other religious orders in his diocese. Pius IX refused him the cardinal's hat and rebuked him for his liberalism. In the Vatican Council he was one of the leaders of the minority who opposed the declaration of papal infallibility on the ground that such a declaration was inopportune; but after the definition he was one of the first among its former opponents to make submission. In the siege of Paris by the Prussian armies he won universal approval for his devoted labors in relieving the wounded and succoring the distressed; and when the Communards, known to be his mortal foes, came into control of the city, he refused to seek safety outside the walls. Arrested by the Commune and held as a hostage, he with other hostages was shot to death in the yard of the prison of La Roquette. The end came while he was in the attitude of blessing his assassins and invoking forgiveness for them. His body was recovered with difficulty and was buried with imposing ceremony at the public expense on June 7, 1871. It was not a mere accident or coincidence that he was the author of a *Life of Saint Thomas à Becket* (1859), that archbishop of Canterbury, who was slain by assassins before the high altar of his cathedral

church 700 years before; within 23 years he had seen his two nearest predecessors, archbishops of Paris, murdered, one by an individual assassin, the other, Denis Auguste Affre, by the insurgent populace. In addition to his scholarly work, *The Life of Saint Thomas à Becket*, he wrote a new translation of *Dionysius the Areopagite*, and also a translation of the *Imitation of Christ; Women of the Bible; Holy Women*.

DARBY, John, American educator: b. North Adams, Mass., Sept. 27, 1804; d. New York City, Sept. 1, 1877. As a young boy he began to work in a mill to help support his mother and the other children. He enrolled at Williams College and graduated there in 1831, although his early education was derived entirely from self-teaching. During his lifetime he taught at Williamstown Academy, Barhamville Seminary near Columbia, S. C., Wesleyan Female College at Macon, Ga., and at Williams College where he was made professor of mathematics. In 1869 he became professor of science at Kentucky Wesleyan College, at Millersburg, and he was there as a professor or president until 1876, when he retired. He was the author of several science textbooks which were widely used.

DARBY, John Nelson, founder of the Plymouth Brethren: b. London, Nov. 18, 1800; d. Bournemouth, Apr. 29, 1882. In 1819 he was graduated at Trinity College, Dublin, and was called to the Irish bar in 1825. He left the Church of Ireland because of conscientious scruples, believing that denominational distinctions and a regular ministry should be discarded. He formed an association in Dublin in 1828. Another was organized soon after in Plymouth, and the fact that Providence Chapel was the first regular place of meeting gave the name Plymouth Brethren to the sect in 1830. Darby labored as an evangelist in England and on the Continent until his death in 1882. He preached in English, French and German, and for many years edited the *Christian Witness*, the official organ of the Brethren. See also **DARBYITES**.

DARBY, William, American geographer: b. Lancaster (now Dauphin) County, Pa., Aug. 14, 1775; d. Oct. 9, 1854. He spent his youth in Ohio and, self-educated, began teaching school at the age of 18. Darby moved to Natchez, Miss., and became a cotton planter but, because of financial reverses, took a job as deputy surveyor for the United States. Finding existing surveys unsatisfactory, he made some original ones. He acquired considerable knowledge as a member of Jackson's topographical staff during the battles of 1814-1815. Darby was one of the surveyors in 1818 who made the boundary between Canada and the United States. His map of the United States was used for making the treaty boundaries with Spain in 1819. He lived the last 35 years around Washington, D.C., where he was a lecturer and author as well as a government clerk. He was ranked as one of the country's outstanding geographers and published a great many articles and revised editions of gazetteers.

DARBY, borough, Pennsylvania, Delaware County; altitude 43 feet; on Darby Creek, adjoining Philadelphia on the southeast; on the Baltimore and Ohio and Pennsylvania railroads. Primarily residential, it has few factories. It has

a library which dates from 1743 and a Friends meetinghouse (1805; earlier building, 1701). The borough was settled in 1682 by Philadelphia Quakers. The botanist John Bartram (q.v.) was born near Darby. Pop. (1950) 13,154.

DARBY AND JOAN, the names of a married couple traditionally reported to have lived in the West Riding of Yorkshire in the 18th century, remarkable for their long and happy life together. A ballad entitled *The Happy Old Couple*, by Henry Woodfall, former apprentice to the printer John Darby, commemorates their excellencies. Humdrum, uneventful married life is sometimes referred to as a "Darby and Joan" existence.

DARBYITES, a name often applied to the Plymouth Brethren (q.v.) from their principal founder, John Nelson Darby (1800-1882), of whose collected writings 32 volumes have appeared (London 1867-1883).

Consult Darby, John N., *Personal Recollections* (London 1881).

DARBYSHIRE, Alfred, English architect: b. Salford, Lancashire, June 20, 1839; d. July 5, 1908. He began his practice of his profession in 1862 at Manchester and designed many buildings of importance there and elsewhere. His principal literary works are *Experiences of an Architect, Professional, Artistic, and Theatrical; A Book of Old Manchester and Salford*.

DARC or **D'ARC**, Jeanne. See **JOAN OF ARC**.

DARCET, dâr-sê', Jean, French physician and chemist: b. Douazit, Sept. 7, 1725; d. Paris, Feb. 13, 1801. He accompanied the celebrated Baron de la Brède et de Montesquieu to Paris in 1742, and remained with him till his death as a literary assistant. He afterward devoted himself to chemistry, especially to technical chemistry, was appointed professor of chemistry in the College of France, and regent of the medical faculty. Darcet made many experiments with a view to the improvement of the manufacture of porcelain. He also tried the effect of fire on the various kinds of earths, and demonstrated the volatility of the diamond. In 1776 he published a memoir on the geology of the Pyrenees. He succeeded Pierre Joseph Macquer as a member of the Academy of Sciences and director of the manufactory of Sèvres. He was afterward appointed inspector general of the assay of coin and inspector of the Gobelins manufactory. He made several important chemical discoveries, and contributed much to the present improved state of the science. A fusible alloy of lead, bismuth, and tin is named after him. He published several works describing his discoveries.

DARCET, Jean Pierre Joseph, French chemist: b. Paris, Aug. 31, 1777; d. there, Aug. 2, 1844. He was a son of Jean Darcet (q.v.). He began his chemical studies early with his father and with Louis Nicolas Vauquelin. In his 24th year he was made assayer of the mint, and from that time devoted his time chiefly to chemistry in its application to the arts. Being employed by the government in the manufacture of gunpowder, he rendered its preparation much more easy by new processes. He greatly assisted in extending the

manufacture of soda artificially, succeeded in producing alum equal in quality to that of Italy, brought the art of stereotyping to greater perfection, facilitated the preparation of sulphuric acid, and investigated the best alloys for cannon, for cymbals, for tom-toms and for statues. Among his other discoveries were the extraction of soda from chestnuts, the preparation of sugar from the same material and extraction of jelly from bones by means of an acid. He also discovered a better means of protection against the fine dust of quicksilver, injurious to gilders.

DARCY, BARON Thomas, English soldier and statesman: b. 1467; d. London, June 30, 1537. He fought in the wars with France and Scotland, and was a privy counselor of Henry VIII. After approving Henry's divorce, he opposed it. He and Lord Hussey conspired against the king in 1539, and in 1536 aided the Pilgrimage of Grace rebellion. He was pardoned; but being implicated in Sir F. Bigod's rebellion, he and Lord Hussey were beheaded.

DARCY, Thomas Francis, Jr., United States army band leader: b. Vancouver, Wash., May 7, 1895. He began his army career as a cornetist in the 2d Field Artillery Band. During World War I while serving with the 1st Division in France he was wounded and cited for gallantry. Assistant leader of the United States Army Band in 1926, he was made leader in 1935.

DARDANELLE, dār-d'n-ēl', city, Arkansas, Yell County seat, altitude 325 feet, on the Arkansas River, about 70 miles northwest of Little Rock. Situated in the farm area near Mount Nebo State Park, Dardanelle was platted in 1843. It is a center for cotton ginning and sawmilling. Pop. (1950) 1,772.

DARDANELLES, dār-d'n-ēlz', the 40-mile-long strait through which the Sea of Marmara drains into the Aegean. Formerly called the Hellespont, this strait is the third and last unit in the three-part waterway (Bosporus, Marmara, Dardanelles) which is the Black Sea's only outlet to the high seas. Since the Dardanelles, four miles wide at its broadest and about four fifths of a mile at its narrowest point, is also one of the two possible ferry points (see Bosporus) for the shortest overland route from Asia and the Near East to Europe, the Straits area has been of strategic and commercial importance from early times.

In Turkish the Dardanelles is called the Strait of Canakkale, the principal town on the Asiatic (southern) shore, some two thirds of the way from the Marmara to the Aegean. Here are located the coastguard and pilot services by which Turkey, which owns both Dardanelles shores, controls traffic through the strait. The one important town on the European (northern) shore is Gallipoli (Turkish *Gelibolu*), which gives its name to the Gallipoli Peninsula whose southern coast forms the whole of the strait's European shore.

In length and width the Dardanelles is about twice the size of the Bosporus. The north shore is hilly, and especially toward the Aegean, steep cliffs descend directly to narrow beaches. The south shore includes several stream-mouths whose deltas fan out from the Asiatic hills into a coastal plain up to five miles deep. There is no safe harbor to compare with the famed Golden Horn

of the Bosporus. The Dardanelles' hinterland also lacks easy routes connecting with the transit-highway which joins the ferry at the Bosporus. Hence, in modern times, this strait has been principally a route for sea passage, while the land routes have centered at Constantinople (now Istanbul).

Although the strait never freezes, navigation in the Dardanelles is made difficult by unfavorable winds, fierce seasonal storms, strong shifting currents, and frequent fog. As in the Bosporus, two currents exist: a surface current from, and a sub-surface current into, the Marmara Sea.

The strait is named for Dardanus, mythical ancestor of the Trojans. Its alternate name, the Hellespont, is assigned to Helle, daughter of Athamas of Thebes, who is said to have passed here en route to Colchis. Better known is the legend of Hero, priestess of Aphrodite, who lived at Sestos on the European shore, and of her lover Leander of Abydos on the Asiatic coast. Nightly he swam across to visit his beloved until, a storm having put out the light by which she guided him, he was caught in the currents and perished. In her grief, Hero cast herself into the strait. The shore of the Dardanelles is also the site of Troy, immortalized in Homer's *Iliad*. This site, now called Hissarlik, some three miles inland from the Asian coast's southwesternmost point, has been studied since Heinrich Schliemann began excavations in 1871. The earliest fortified settlement antedates 3000 B.C. The seventh of the superimposed cities is Homer's Troy, conquered by the Achaeans about 1200 B.C.

Under Greek dominance the commercial importance of the Straits area increased. Greek colonies appeared, especially along the Dardanelles; and the Marmara (Propontis) and Black (Euxine) seas came into the Greek navigator's purview. The region's Asiatic parts were included in the Persian Empire, but enjoyed enough autonomy to retain their native character. Darius' Scythian expedition (512 B.C.) crossed into Europe by way of the Bosporus, but in the campaign of Thermopylae and Salamis (480 B.C.) Xerxes passed the Dardanelles by means of two boat-bridges. The region was next controlled by Athens, for which the Black Sea grain trade was vital, and was much involved in the Peloponnesian Wars.

Alexander the Great crossed the Dardanelles in 334 B.C. to begin his Asiatic conquests. In the wars of his successors, Lysimachus almost established a world power based on the Straits.

For Rome the Straits were important as a vital point both against the forces of Mithridates, creator of history's first Black Sea fleet, and for controlling barbarian migrations.

Constantine's formal rededication (330 A.D.) of Byzantium, thenceforth Constantinople, as capital of East Rome made the Bosporus the seat of a world power. The Straits' importance as a waterway, did not thereafter greatly alter until 1452. Only then were cannon able to span the narrows and so control passage of hostile craft in all weathers and under all conditions. Before that date the Byzantines at Constantinople had defeated many assaults. Most important were those of the Persians (626) and of the Arabs (663-678, 717). By the age of the Crusades, Byzantine territory and resources had so dwindled that the region was no longer secure.

Of the Italian maritime states which long had competed in eastern waters, Genoa was best

established at Constantinople, with Black Sea trading privileges which virtually excluded her rival, Venice. Venice, in 1204, diverted the so-called Fourth Crusade to capture and sack Constantinople. The Straits region then was shared out among western lords (the Latins in the Levant), but the Greeks soon reassembled in northwest Asia Minor and re-established themselves on the Straits well before they retook Constantinople (1261), a victory which restored the Black Sea trade to the Genoese. The Fourth Crusade, however, further weakened Byzantine resistance to the Turks, the new west Asian foe who now threatened the Straits.

After 1300 the Ottoman Turks extended their Asia Minor principality to the Straits and then (1354) at Gallipoli gained a foothold on the European shore. Thereafter they speedily penetrated the Balkans. When in 1453 they finally took Constantinople and so made the entire Straits area Turkish, they long had held much of south-east Europe as well as Asia Minor.

Since the Turks after 1452 were the first power able to close the Straits to all comers at all times, this may be taken as the date at which the historic Straits Question arose: under what conditions would ships of other powers be permitted passage? For some 250 years, however, this question remained in abeyance. The Ottomans became a great naval power, made the Black Sea a "Turkish lake," but did not evolve a large commercial fleet to trade on the world's oceans. Instead, like the earlier Byzantines, they permitted Westerners to navigate Turkish waters and trade in Turkish markets under the capitulations system of special privileges. As a hostile naval power, Venice was denied control of the eastern Mediterranean, but as a friendly commercial power she was allowed to prosper in that region. And other western powers, especially France, England, and the Netherlands also flourished as capitularies.

Shortly before 1700 the Ottomans irretrievably lost the power to deal on equal terms with European foes. Thus arose the Eastern Question: which European power would get what share of the Ottomans' collapsing state and, pending its demise, what special extraterritorial privileges within it? The situation was complicated by the Russian seizure of the Crimea (1783) and consequent emergence as a Black Sea power. Thenceforth for both Czarist and Soviet governments, the Straits have been vital, while the larger prize, possession of the waterway, has also been of the greatest importance. The Straits are Russia's one vital all-weather outlet to the high seas.

In the 1830's general use of steamships sharpened the Straits Question, for now, prevailing north winds no longer closed the Dardanelles to Aegean shipping for weeks at a time, as had been the case before. Henceforth vessels of peace or war moved at will.

By 1900 Germany had become concerned in the Eastern Question, and close attention was focused on the Straits by all the major European powers: the Ottoman Empire now owed its continuing life in no small measure to the inability of England, France, Germany, Austria, and Russia to agree on its partition.

In World War I, Turkey early espoused the German cause. Aided by their German allies, the Turks long withstood the British attempt to force the Dardanelles (see WAR, EUROPEAN—*Turkish Campaigns*), but were overwhelmed in 1918. By the Treaty of Sèvres, Turkey relinquished control

of the Straits. Because of the prior demise of Czarist Russia, England and France did not now feel obliged to give Istanbul to Russia, as they had promised in secret treaties (1915). By 1923 in the Treaty of Lausanne, the new nationalist Turkish Republic was able to make the West discard the Sèvres plan. In the new arrangement, sovereignty over the Straits remained Turkey's, but the region was demilitarized and placed under international control. Rising tensions in the eastern Mediterranean in 1936, however, enabled Turkey to seek a further revision of the state of affairs. On July 20 1936, 10 signatories (Turkey, Russia, Rumania, Bulgaria, Great Britain, British Dominions, France, Yugoslavia, Greece, and Japan) agreed to the Montreux Convention permitting Turkey to refortify the Straits, guaranteeing to all free passage on certain conditions in peacetime, but allowing Turkey to deny passage to armed vessels in time of war.

In World War I the airplane was of little consequence at the Dardanelles. In World War II, it revolutionized the Straits' role. Close-in blockade was no longer needed: air fields effectively closed the Straits. A neutral Turkey controlled unarmed traffic, and German planes at a distance denied passage to whom they would.

At the end of the war, Soviet Russia, which previously had stated that it was well content with Turkey's course, charged that the Turks had favored the Germans, denounced the current Russo-Turkish treaty, and reportedly demanded: (1) the immediate right to install Soviet bases on Turkish soil along the Straits; (2) a new regime to replace the Montreux Convention; and (3) cession of Turkey's eastern provinces, Kars and Ardahan, which once had belonged briefly to Russia. These demands amounted to an overt repudiation of Russia's traditional ambition to control the Straits. Turkey refused, and was supported by Great Britain and the United States. Beginning in 1947, with the military and economic aid provided under the Truman Doctrine, the United States strengthened Turkey's power to resist Russian demands. The Straits Question was frequently raised in post-World War II international conferences, and the West unanimously supported Turkey's position: a readiness for general renegotiation of the Montreux Convention but a refusal to enter into two-party dealings with Russia on this question. By the summer of 1953 Russia had renounced direct claims on Turkey's territory, but the Turkish government, convinced that Russian ambition to control the Straits had not abated, continued a policy of active armament and cooperation with the West.

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LEWIS V. THOMAS,
Department of Oriental Languages and Literatures, Princeton University.

DARDANUS, dār'dā-nūs, in mythology, the progenitor of the Trojans, and so of the Romans, and the son of Zeus and Electra, the daughter of Atlas. He emigrated from Samothrace (according to some accounts, from Arcadia, or Crete) and settled in Phrygia in the country which was afterward called Troas. Here he built a city,

which was called Dardanum, or Dardanus, after him, and introduced the worship of Athena (Minerva).

DARDISTAN, dār-dīs-tān', region of central Asia on the northwest frontier of India, between Kashmir and Afghanistan, on the south Hindu Kush. This country, which consists of lofty mountains, is little known, and its limits are variously given; its importance depends mainly on the fact that its inhabitants, the Dards, are an Aryan people speaking a Sanskritic tongue mixed with Persian words. They have been called "Stray Aryans in Tibet," and are Moslems converted from Buddhism at a comparatively recent period. The chief districts include Astor, Gilgit, and the upper reaches of the Indus River; some authorities also include Chitral in Dardistan.

DARE, Virginia, first child born of English parents in the New World: b. Roanoke Island, Virginia Colony (now in North Carolina), Aug. 18, 1587, and named after the colony. She was the granddaughter of John White, governor of the expedition sent out by Sir Walter Raleigh to found an agricultural state. Sailing from Plymouth, England, on April 26, 1587, the colonists landed on Roanoke in July. White's daughter Ellinor, or Elyoner, was married to Ananias Dare, an assistant of the governor. Nine days after Virginia's birth White sailed back to England to obtain supplies for the colony, but his return to Virginia was delayed by the war with Spain. When the relief expedition finally arrived (1591), no trace of the settlers could be found. Presumably all were killed by the Indians.

DARES PHRYGIUS, dā'rēz frī'jē-ās, a priest of Hephaestus at Troy, reputed author of a pre-Homeric open on the fall of Troy. A Latin work, *Daretis Phrygii de excidio Troiae historia*, on the basis of a forged dedicatory letter from Cornelius Nepos to Sallust, purported to be a translation of Dares. Universally discredited (it was probably written in the 5th century A.D.), it is generally printed with a work attributed to Dictys Cretensis, both of which were widely used as source material by medieval historians of the Trojan War.

DARESTE DE LA CHAVANNE, dā-rēst' dē là shā-vān', Antoine Élisabeth Cléophas, French historian: b. Paris, France, Oct. 28, 1820; d. Lucenay-les-Aix, Aug. 6, 1882. Educated at the École des Chartes, he was a professor in the faculty of letters at Grenoble in 1844, and at Lyon in 1849. He is best known for his monumental *Histoire de France* in nine volumes (1865-1879).

His brother, RODOLPHE DARESTE DE LA CHAVANNE (1824-1911), was a magistrate and scholar, and the author of *Études d'Histoire de Droit* (1889).

DARFUR, dār-fōōr' (Country of the Fur), westernmost province of the Anglo-Egyptian Sudan. It may be considered as lying between latitude 10° and 16° N. and longitude 22° and 28° E.; area, 138,150 square miles. It is bounded on the east by Kordofan; on the west, by the French Equatorial province of Chad; on the north, by the Libyan Desert; and on the south, by a region inhabited by barbarous tribes. The most important physical feature is a range of

mountains, the Jebel Marra, crescent in shape, volcanic in origin, which lies in the center of the country and reaches a height of over 10,000 feet. There seem to be no permanent streams, the watercourses being filled only temporarily. The country belongs mainly to the Nile basin, partly to that of Lake Chad. Large portions of it are barren or are covered with verdure only in the rainy season. The inhabitants are of various races, some of them of the Negro type, others having little of the Negro character, a considerable number being Arabs. The Fur, or For, who give the country its name, inhabit the mountainous central parts, and are a brownish-black color with Negro features. Mohammedanism is the prevailing religion.

The natives are still semibarbarous. Their chief occupation is agriculture, only a few of the mechanical arts being carried on. Manufacture is limited to cotton goods, pottery, leather, and lance-heads. Among the exports the most important are camels, ivory, the horns, teeth, and hides of the rhinoceros and hippopotamus, ostrich feathers, gum, and copper. Imports comprise beads, glass, arms, light cloths, silks, and other manufactured articles. Darfur was an independent kingdom until annexed by Egypt in 1874. During the ascendancy of the Mahdi, the "Mad Mullah," and his successor (1883-1898) it was independent; in 1898 it was incorporated into the Anglo-Egyptian Sudan, and after the uprising of 1915 it became a Sudanese province, with a resident sultan managing internal affairs. The capital is El Fasher. Pop. (1948 est.) 910,565.

DARGAN, dār'gān, Edmund Strother, American jurist: b. Montgomery County, N. C., April 15, 1805; d. Mobile, Ala., Nov. 24, 1879. He entered a law office at Wadesboro, N. C., and, after a year of training, went to Washington, Ala., where he taught school and practiced law. In 1845 he was a member of the 29th Congress, as a Democrat, but after one term he declined renomination. He is credited with the final solution to the problem of Oregon's northwest boundary which was an important subject of debate. He served on the Alabama Supreme Court for five years, until 1852, having been chief justice since 1849.

DARGAN, Edwin Preston, American educator: b. Barboursville, Va., Sept. 7, 1879; d. Chicago, Ill., Dec. 13, 1940. Johns Hopkins University awarded him a Ph.D. in 1906. He taught French at the University of Virginia and the University of California, and from 1911 until his death he was on the faculty of the University of Chicago. A leading American authority on Honoré de Balzac, his works include *The Aesthetic Doctrine of Montesquieu* (1907); *Honoré de Balzac—A Force of Nature* (1932); *Anatole France* (1937).

DARGAN, Olive Tilford, American author; b. Grayson County, Ky. She attended the University of Nashville and Radcliffe College, and, before she married Pegram Dargan, had taught school in the United States and Canada. Mrs. Dargan has written plays, poetry, and novels, and in 1916 was awarded a prize by the Southern Society of New York for the best book by a Southern writer. Three of her novels, *Call Home the Heart* (1932), *A Stone Came Rolling* (1935), and *Sons of the Stranger* (1947) were published under the pen name of Fielding Burke

DARGOMYZHSKI, dŭr-gŭ-mish'skŭ-ĭ, **Aleksandr Sergeevich**, Russian composer: b. Tula, Feb. 14, 1813; d. St. Petersburg, Jan. 17, 1869. At an early age he began the study of piano and violin and at 11 made his first attempts at musical composition. His early friendship with another young Russian composer, Mikhail Glinka (q.v.), was very important to his writing, because Glinka gave him his only training in theories of composition. Glinka's *A Life for the Czar* was produced with great success in 1836; Dargomyzhski's first opera *Esmeralda*, while completed in 1839, was not accepted by the Imperial Opera for eight years. This was discouraging to the young musician but did not stop him from continuing composition. The story for *Esmeralda* had been taken from Victor Hugo's *Notre Dame de Paris*, and its score showed the influence of Daniel Auber and Gioacchino Rossini.

In 1842 he began a cantata based on Alexander Pushkin's poem *The Triumph of Bacchus* and later changed it into a ballet-opera. His opera *Russalka* (*The Mermaid*), also based on a Pushkin story, was performed for the first time in 1856 at St. Petersburg. He did not live to complete his last opera, *The Stone Guest*, the libretto for which was taken from Pushkin's version of the Don Juan legend. It was a last request that Nikolai Rimski-Korsakov make the orchestration for it, which he did, and the opera was first performed in 1872. *The Stone Guest*, like *Russalka*, never became a favorite with audiences who loved and had become accustomed to Italian opera.

He also wrote a great amount of vocal music for duets, quartets, and choruses, as well as three orchestral works: *Kazachok*, *Baba-Yaga*, and *The Dance of Mummies*.

As a composer, Dargomyzhski was a pioneer in the Russian nationalist school.

He was closely associated with M. A. Balakirev and his disciples, and his music reflects a close attention to realistic expression.

DARIC, dār'ĭk, properly **DARICUS** (Gr. δαρεικός), an ancient Persian coin of pure gold, specimens of which are still preserved in several European collections, bearing on one side the image of a kneeling archer, on the other that of a royal palla. It was known to the Greeks, Romans and Jews; the latter used it after the Babylonian captivity, under the reign of the Persians, and called it *adarkon* or *darkemon* (mentioned in the first book of Chronicles, by Esdras and Nehemiah). Its value was equal to 20 silver drachmae, or 16 shillings 3 pence; 3,000 being equal (according to Xenophon) to 10 talents. Its name is variously derived from that of King Darius Hystaspes, who regulated the Persian currency, and from several Persian words meaning king, palace and bow. The so-called silver darics were not designated by this name in antiquity.

DARIEN, town, Conn., in Fairfield County, on Long Island Sound. Bounded on the west by Stamford on the far bank of the Noroton River, on the east by Norwalk on the far side of Five Mile River, and north by New Canaan, it has an area of 9,536 acres. It is traversed by the Boston Post Road and other main highways. Rail service is by the New York, New Haven and Hartford Railroad. A residential town, many of its inhabitants commute to New York. There are six public schools and five private schools, a theater and a bank. The local weekly is *The Darien Re-*

view. The oldest of its several churches is the First Congregational, organized in 1739, the present edifice dating from 1837.

Settled in 1642 as part of Stamford and called Middlesex Parish, it became a separate town in 1820 by act of the Assembly. It is said that a local celebrity, a veteran of the Revolution and an assemblyman, Thaddeus Bell, declined the honor of having the new town named in his honor or that of his ancestors who were among the settlers. Bell proposed an idea of a seafaring friend that it be named Darien, since it was an isthmus connecting the major communities of Norwalk and Stamford. The townsmen agreed and Bell carried their petition on horseback to the legislature at New Haven. Government is by a board of selectmen. Pop. (1950) 11,278.

DARIEN, city, Georgia, and McIntosh County seat; altitude 31 feet; on the Altamaha River; 73 miles southwest of Savannah, 17 miles north of Brunswick, the nearest railway center. It ships lumber, oysters, shrimps, terrapin, fish and garden produce. A state park (1938) marks the site of a blockhouse built in 1721 and of the Highlanders' fort of 1736. Across the river the 350-acre Boys Estate (1925) commemorates Spanish rule. Darien had a heavy trade in timber after the War of 1812. The city was burned by a Union army in June 1863. Pop. (1940) 1,015 (1950) 1,380.

DARIEN, dā-ryān' (originally named **SANTA MARIA LA ANTIGUA DEL DARIEN**), settlement and colony, established by the Spaniards on the Gulf of Urabá (see **DARIEN**, **GULF OF**), in the first decade of the 16th century, was the center from which exploring expeditions were sent out until Panamá was founded in 1519. A notary of Triana, named Bastidas, sailed along the Caribbean coast of the isthmus in 1501, Balboa being one of his companions. At the end of 1502 and beginning of 1503 Columbus carefully examined the region immediately west of this gulf. In 1508 the king granted to Nicuesa the territory from the Gulf of Darien to Cape Gracias a Dios; to Ojeda, the territory from the Gulf of Darien to Cape de la Vela. The dividing line was more precisely fixed by the grantees, who agreed that it should be the Atrato River. In that event the only permanent settlements were made near this river and the gulf into which it flows. Ojeda first landed at Cartagena (1509), where his expedition endured great hardships. Removing thence to the eastern side of the Gulf of Urabá, he built the fort called San Sebastian, which he entrusted to Francisco Pizarro, and then returned to the West Indies. Pizarro, Balboa and all who remained alive set sail for Cartagena once more. There they were met by Enciso, with re-enforcements from San Domingo, and after some hesitation, crossed the gulf to the western shore, where the colony of Santa Maria de la Antigua del Darien was established in 1510. Balboa gained ascendancy by recommending the selection of this place (which he had visited with Bastidas) and became the leading spirit in the undertakings which followed—the expedition to Dabaiba, the crossing of the isthmus, etc. (see **BALBOA**).

Nicuesa's expedition, though it started under brighter auspices, resulted in a lamentable failure. Its courtly leader, after losing nearly all his followers near Cape Nombre de Dios, was forced to put to sea in a boat that could not

outlive a single storm—practically condemned to death by the authorities at Darien, whom he had offended. In 1514 Pedrarias Dávila (Pedro Arias de Ávila) succeeded Balboa as governor and five years later founded Panama City on the Pacific coast. Thereafter the colony of Darien declined and was finally abandoned as the isthmian traffic sought and found an easier route, better harbors, and a less deadly climate at a distance from the Gulf of Urabá.

DARIEN, Gulf of, an extension of the Caribbean Sea forming a wedge-shaped indentation in the northern coast of Colombia. Of great width between Colón and Cartagena, it narrows into the Gulf of Urabá, a deep bay extending about 50 miles southward, and receives the Atrato River at its southern end. South of Cape Tiburón and Caribana Point, which form the mouth of the Gulf of Urabá, its shores are fertile, but unhealthy and largely undeveloped. The main port is Turbo, department of Antioquia, near which oil has been discovered. For the history of the area, see DARIEN.

DARIEN, Isthmus of. See PANAMA, ISTHMUS OF.

DARIEN SCHEME, a celebrated financial project undertaken by the Company of Scotland Trading to Africa and the Indies. This company, founded by Robert Blackwood and James Balfour in 1695 and dissolved by the Act of Union in 1707, was known by subsequent generations as the Darien Company, after its most famous enterprise. The Darien Scheme was conceived and organized by William Patterson (qv) to form an emporium on each side of the Isthmus of Darien or Panama. According to his idea the manufactures of Europe were to be sent to the Gulf of Darien and thence conveyed by land across the ridge of mountains that intersects the isthmus, where they were to be exchanged for the produce of South America and Asia. In order to attract encouragement and support, he proposed to render his settlement a free port and to banish all distinction of party, religion, or nation. He encountered much difficulty in financing the project, but finally in 1698 five large vessels, laden with merchandise, military stores, and provisions, with a colony of 1,200 persons, sailed for the Isthmus of Darien, which they reached after a voyage of about four months.

The settlement was made between Portobelo (Porto Bello) and Cartagena in a secure and capacious harbor, formed by a peninsula which the colonists fortified and named Fort St. Andrew. To the settlement they gave the name New Caledonia. The colony bore up against accumulated misfortunes until June 1699, when those who survived were compelled by disease and famine to return to Europe.

Before this circumstance was known, two more expeditions left Scotland in the same year and arrived to find the huts burned and the forts demolished. The new colonists also suffered from famine and disease and from attacks by hostile Spanish colonials. In less than a year they were obliged to capitulate to the Spaniards, and few of those who survived ever made their way back to Scotland.

Scottish frustration following the failure of this commercial enterprise was offset in part by England's agreement to purchase the Darien

Company's stock. This agreement contributed to the success of the Act of Union in 1707.

Consult Barbour, J. S., *A History of William Patterson and the Darien Company* (Edinburgh 1907); Insh, G. P., *The Company of Scotland Trading to Africa and the Indies* (New York 1932).

DA RIMINI, Francesca. See FRANCESCA DA RIMINI.

DARIO, da-ré'ô, **Rubén** (pen name of FÉLIX RUBÉN GARCÍA-SARMIENTO, gar-sé'a-sar-myán'tô), Nicaraguan poet and short story writer: b. Metapa, Department of Segovia, Nicaragua, Jan. 18, 1867; d. León, Nicaragua, Feb. 6, 1916. One of the outstanding poets of Latin America, Darío infused the spirit and techniques of French modernism into the poetry of the Spanish language.

Shortly after his birth, Darío's parents separated, and young Darío was brought up by relatives in León, where he studied at the Jesuit secondary school and at the National Institute. A child prodigy, he wrote verses at the age of five or six and became known throughout Central America as the "boy poet." His early poems (published posthumously as *Poemas de adolescencia, poemas de juventud*, 1923-1924) reveal the influence of Victor Hugo, to whose poetry he had been introduced by the poet Francesco Gavidia during a brief visit to San Salvador in 1881.

After several years as a journalist in Santiago, Valparaíso, and Buenos Aires, Darío returned to Nicaragua (1889). While in Chile, he had edited the journal *La Época* and sought his inspiration in contemporary French literature, especially in the Parnassian school of poetry headed by Catulle Mendès. The result of this new influence was a collection of verse and prose sketches, *Azul* (1888), which introduced the literary cult of modernism into Spanish American letters.

In 1892 Darío made his first trip to Spain as a delegate to the 4th centennial celebrating the discovery of America. In the next year he visited Paris and New York, and then went to Buenos Aires, where he held diplomatic and journalistic positions, chief among the latter being correspondent to *La Nación*. Thereafter he resided temporarily in various Latin American cities, and in Paris and Madrid.

Darío's personal life was tragic. Often in love, he suffered much from romantic disappointments. His first marriage was terminated in 1892 by the death of his wife at the birth of a son, and a subsequent marriage ended in a separation. He had undermined his health by frequent bouts of alcoholism and an addiction to morphine, and his last illness occurred in 1915 while on a visit to New York. He died soon after his return to his native land.

Darío laid the foundation for a new style in Spanish poetry. After *Azul*, his two greatest works, *Prosas profanas* (1896) and *Cantos de vida y esperanza* (1905), brought to a climax the "modernista" movement, whose stylistic creed emphasized poetic form, exoticisms, and the philosophy of "art for art's sake." Verbal melody, nuance, and metaphor were the materials of his palette and with them he fused into one poetic impression all the sources of his imagery—American and Spanish, the regional and the universal, the archaic and the modern.

Besides the works mentioned above, Darío published *Oda a Mitre* (1906); *El Canto Errante* (1910); *El poema del otoño* (1910); and *Canto a la Argentina* (1910); numerous short stories

in periodicals and literary journals; and in collaboration with Eduardo Poirier, the novel *Emelina* (1887). His autobiography, entitled *La vida de Rubén Darío escrita por el mismo*, was published in Buenos Aires in 1910.

Bibliography. For Darío's poems, consult *Poesías completas*, ed. by A. Méndez Plancarte (Madrid 1952) and *Poesía. Libros poéticos completos y antología de la obra dispersa*, ed. by E. Mejía Sánchez (Mexico 1950); for his tales, consult *uentos completos*, ed. by E. Mejía Sánchez (Mexico 1950). For his life and works, consult Mapes, F. K., *L'influence française dans l'oeuvre de Rubén Darío* (Paris 1925); Contreras, F., *Rubén Darío, su vida y su obra* (Paris 1930); Torres Riosco, A., *Rubén Darío* (Cambridge, Mass. 1931); Doyle, H. G., *A Bibliography of Rubén Darío* (Cambridge, Mass. 1935); Davis, H. E., *Latin American Leaders* (New York 1949).

DARIUS, dá-ri'ús (in Old Persian, DARAYA-VAUSH), the name of several Persian kings. Among the most distinguished of this name are the following:*

DARIUS I (surnamed HYSTASPIS; called DARIUS THE GREAT), 4th king of Persia: b. about 550 B.C.; d. 486 B.C.; r. 522-486 B.C. A kinsman of Cyrus and Cambyses, Darius was the son of Hystaspes, satrap of Parthia. He accompanied Cambyses on his conquest of Egypt, but hastened back to Parsa in 522 when Cambyses committed suicide on learning of the revolt of Bardiya. This rebel, according to the Behistun inscription of Darius, was Gaumata, a Magian, posing as the king's brother, whom Cambyses, fearing revolt, had secretly killed before going to Egypt. Some authorities insist, however, that evidence points to Darius as a "monumental liar" and as a usurper of the throne.

After he came to power, Darius needed two years to pacify the empire, as even Parsa and Media refused to acknowledge him king. During this time Jewish nationalism flared under Zerubabel, scion of David, and the prophets Haggai and Zechariah, but was apparently quelled when Darius passed through Palestine in 519-518 on his way to reconquer Egypt. Once his position was established, Darius instituted administrative reforms which were embodied in his Ordinance of Good Regulations. This law code, published in Aramaic, the empire's language of commerce and diplomacy, was based on the famous Hammurabi Code and earned Darius the title of Great Lawgiver, acknowledged by Plato, among others. Administration of this law was so strict that the Jews could speak of "the law of the Medes and the Persians which alters not." On this foundation his less able successors ruled for almost two centuries. By 513, Darius had extended the empire eastward to the Indus and westward to Thrace and Macedonia, in that year almost meeting disaster in his pursuit of the Scythians beyond the Danube. In Egypt he reopened the canal joining the Nile and the Red Sea and thereby enabled his ships to pass from Ionia to Parsa. His reputation as a builder was furthered by new structures in Susa, Babylon, and Ecbatana, and by his newly erected capital at Persepolis in Parsa, where splendid palaces on a high platform still raise their awesome ruins to the Persian sun and sky.

Trouble came with the revolt of the Ionian cities in 500. Although this revolt was put down by 497, Darius determined to punish democratic

Athens for daring to send aid to the rebels. To spearhead his attack, Darius announced a new policy of support for democracy, a change that elicited the wonder of Herodotus. The first Persian attack in 492 failed when half of the huge Persian fleet and 20,000 men were destroyed rounding Mount Athos, and the armies on land were cut up and delayed by the Brygi. The second attack in 490 across the Aegean landed successfully and subdued Eretria. But the revengeful destruction of that city, contrary to Persian policy hitherto, so aroused the Greeks that resistance under Athenian leadership led to the Greek victory at Marathon and the Persian retreat from Europe.

Carefully Darius prepared his revenge and planned to lead another campaign himself. For this effort the empire was so heavily taxed that Egypt revolted. Before Darius could put down this revolt and gather his armies in Ionia, he died in November 486. Fortunately for the Greeks, the campaign was bequeathed to his less able son, Xerxes.

DARIUS II (originally OCHUS; surnamed in Greek NOTHUS, i.e. bastard): r. 423-404 B.C. The illegitimate son of Artaxerxes I, he gained the throne by murder and perjury, done ostensibly to avenge Xerxes II, the legitimate heir. He was dominated by his half-sister wife Parysatis, a master of political intrigue. It was she who made her favorite son Cyrus (the Younger) satrap of all Asia Minor, abandoned the policy of "divide and conquer" that had made Artaxerxes dictator to Hellas, and brought the Peloponnesian War to a close in a Spartan victory over Athens by Persian diplomacy and gold. Darius recalled the young satrap, but died before Cyrus arrived at court.

DARIUS III (surnamed CODOMANNUS): b. about 380 B.C.; d. 330 B.C.; r. 336-331 B.C. Although the third ruler to bear this name was courageous and able, affairs of the empire had deteriorated too far for him to master the changing world. Darius III ascended the throne shortly before Philip of Macedon was murdered, and had time to reconquer Egypt and begin construction of his palace and tomb at Persepolis before he was faced with the forces of Philip's son, Alexander the Great. Defeated at the river Granicus, Darius failed to capitalize on Alexander's exposed position, and ordered his men to fall back on Cilicia, leaving its famous gates unguarded. Here Alexander came in pursuit, but the resourceful Darius was prepared for him at the head of a mighty imperial host. Darius, however, did not await the invader on the broad plains of Syria, favorable to the best use of his superior numbers; instead he crossed the Amanus Mountains (Alma Dağ) to find his enemy, and was utterly routed on the narrow plain of the Issus (333), where the Macedonians had every advantage.

The western half of the empire fell to Alexander, who proceeded to consolidate his rule down the coast and into Egypt, exalting his reputation throughout Asia by his intrepid and ingenious siege and capture of the hitherto impregnable Tyre. In 331 the protagonists met in a final battle east of the Tigris on the plain of Gaugamela, near Arbela, where Darius was routed, fleeing with the Immortals (royal bodyguards) to Ecbatana. There he waited while Alexander took Babylon, Susa, and finally Persepolis, which in 330 was destroyed to revenge

* The dates appearing in this article differ from those of some other authorities. For the basis of the dates used here, see Richard A. Parker and Waldo H. Dubberstein, *Babylonian Chronology 626 B.C.-A.D. 45* (Chicago 1942), especially p. 8.

the Persian burning of Athens. Turning northward, Alexander pursued Darius beyond the Caspian Gates, where he found the king murdered by his Bactrian satrap, Bessus. Darius, last of the Achaemenidae, was brought back to Persepolis and buried with his fathers on the Mount of Mercy overlooking the ruins of Persepolis.

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T. CUYLER YOUNG,
Director of Near Eastern Studies, Princeton University.

DARIUS THE MEDE, mēd. According to the Book of Daniel in the Old Testament, he was the son of Ahasuerus and ruled Babylon after the death of Belshazzar, subsequently being succeeded by Cyrus. History, however, does not record a Median king named Darius: Darius is not a Median name, and historical evidence indicates that Belshazzar was succeeded by Cyrus (called "the Great").

DARJEELING or **DARJILING**, dār-jē'ling, town and hill station, India, capital of the district of the same name in the northern part of West Bengal, 305 miles north of Calcutta. Located in the foothills of the Nepal Himalayas, Darjeeling is famous for its magnificent mountain scenery. When the atmosphere is clear, Kanchenjunga mountain and Mount Everest are visible from the town and nearby eminences. A Buddhist monastery stands on the slope of Observatory Hill, the highest point in town (c.7,160 ft.). Darjeeling's chief industry is the processing of tea which is grown in plantations on the sides of the hills. Other products are rice, corn, cardamom, and oranges, and manufactures include plywood and, at Ghum (Ghoom) village 8 miles south, cutlery and tools. Darjeeling is served by a railway of which it is a terminus.

The town was purchased in 1835 from the raja of Sikkim and made into a health resort for British troops. Two British cantonments, Jalapahar and Lebong, were later included as suburbs. It is the headquarters for the governor of Bengal during the summer months. The population is made up chiefly of Nepalese and Bhutanese. Pop. (1951) 445,260.

DARK AGES, a term used to describe the period in history when the cultural and political traditions of the ancient world were eclipsed in the West after the collapse of Roman civilization and the overrunning of Europe by Germanic tribes. Formerly the whole period called the Middle Ages (476 to approximately 1550) was also called the Dark Ages, but this definition has long been held untenable in the light of the great civilizing achievements of the medieval church and of the Renaissance. Actually there was never a complete break with the past: the German tribes soon incorporated elements of Roman law in their tribal organization; after 529, the year that the Athenian Academy, founded by Plato, was closed, and the Benedictine monastery at Monte Cassino was founded, Christian monks became the curators of ancient wisdom; and personalities like Boethius (480?–524), Cassiodorus (fl. c.540), the Venerable Bede (673–735), and Alcuin (735–804) devoted their lives to the

preservation of ancient thought. The term is nevertheless descriptive of the widespread ignorance and political confusion which prevailed before Christian Europe was gradually consolidated under the impact of the church and the feudalization of society.

Various dates have been given for the end of the Dark Ages. Among these are 800, the coronation of Charlemagne; 1095, the year Pope Urban II proclaimed the First Crusade; and 1100, approximately the beginning of the medieval romance. Because of its lack of clear definition, however, the term is considered obsolete by many modern historians. See also HISTORY, MEDIEVAL; MIDDLE AGES, THE.

DARK AND BLOODY GROUND, a name applied to the State of Kentucky. It is said to be a translation of the Indian words "Kain-tuk-ee," which, however, some authorities claim to mean "At the head of the river." The epithet was originally bestowed because the region was the scene of many sanguinary conflicts between the Indians of the northern and southern tribes. Later the constant feuds between white settlers and the aborigines rendered the phrase peculiarly appropriate to this locality.

DARK DAY, the name given in the United States to May 19, 1780, when the light of the sun was obscured without any apparent cause; it has also been given to other days when similar phenomena have occurred. On the day mentioned the sun rose with normal brightness until about 9 o'clock in the morning, when darkness gradually settled over a large area of New England, causing much alarm and, in some places, the cessation of outdoor labor. It lasted throughout the day, and in the evening the moon was reported to have been blood red. In New England the day was also known as Black Friday. Two earlier dark days in America were reported to have occurred on Oct. 21, 1716 and Oct. 19, 1762. The chief causes for this atmospheric phenomenon over vast areas are volcanic eruptions and forest fires.

In Canada, dark days occurred on Oct. 16, 1785 and July 3, 1814. On the latter date the darkness extended over an area estimated to be about 300 miles in length and 200 miles in breadth in the region of the river and gulf of St. Lawrence. Deep yellow in hue, the atmosphere yielded showers of sand and dark ashes, which pointed to volcanic action as the origin. In 1881, the smoke from great forest fires in the northwestern United States and in Canada affected the atmosphere as far away as New England and the Middle Atlantic states. Among the most famous volcanic explosions which created strange atmospheric effects were those of Krakatau (q.v.) in 1883, when volcanic dust is believed to have encircled the earth and to have caused magnificent sunsets as far away as England, and of Katmai (q.v.) in 1912, when most of Alaska was plunged in darkness for more than two days.

A recent dark day occurred throughout parts of eastern North America on Sunday, Sept. 24, 1954. The source of the atmospheric pollution in this instance was forest fires in northern Alberta, Canada. Although usually not as severe, a darkening of the atmosphere frequently takes place in industrial communities which is caused by smog—a mixture of fog and smoke. This gives the sky a dark-greyish cast for miles around the source.

DARK HORSE, a phrase used in horse racing for a horse whose power of performances or chances of success are not generally known. The expression has been transferred to fields of human competition, and is frequently used in politics, especially in reference to candidates for nomination in a convention when they are unexpectedly brought forward or draw a following that had not been anticipated.

DARLAN, dār-lān', Jean Louis Xavier François, French Naval officer and politician: b. Nérac, department of Lot-et-Garonne, France, Aug. 7, 1881; d. Algiers, Algeria, Dec. 24, 1942. Descended from a seafaring family, Darlan grew up in his native Gascony, attended the Lycée St. Louis in Paris, and after graduating from the French Naval Academy, entered active Naval service in 1902. He commanded naval guns at the Western front during World War I and thereafter had various commands which culminated in his appointment as head of the military cabinet of George Leygues in 1926. In November 1929 he was promoted to rear admiral, the youngest man in Europe to hold that rank. He continued to distinguish himself both in commands and in the ministry, and in 1939 was promoted to full admiral and made commander in chief of the French Naval Forces.

After the fall of France during World War II, Admiral Darlan cooperated fully with the Vichy government—to the extent of even threatening to defy the British blockade to feed France. He held the ministries of Foreign Affairs, National Defense, and Information under Marshal Pétain and also acted as vice premier and as directing member of the French cabinet. In 1942 he was in Algeria during the period that plans were being laid for the landing of American troops in Africa. This operation required the non-resistance of French forces in Africa, which could only be implemented by orders from a top political leader. Gen. Henri Giraud, who was to command the French forces, had not been accepted by the Algerian French politicians to head the government. The allies turned, therefore, to Darlan as the only man in Africa whom the French would obey, even though this move brought forth an outcry, especially by the British, against dealing with such a notorious member of the Vichy regime. Darlan refused to cooperate at first but, on threat of imprisonment, finally agreed. On Nov. 22, 1942, he was made the political leader of French North Africa, and in return he successfully eliminated French resistance, making it possible for American troops to enter Dakar without a casualty. A month later he was assassinated by a young anti-Fascist, Fernand Eugène Bournier de la Chapelle.

DARLSTON, dār'lās-tūn, urban district, England, in south Staffordshire, 4 miles east-southeast of Wolverhampton. An industrial center; Darlston has coal mines and steel-rolling mills and manufactures nuts, bolts, and automobile parts. Pop. (1951) 22,024.

DARLEY, dār'li, Felix Octavius Carr, American artist and illustrator: b. Philadelphia, Pa., June 23, 1822; d. Claymont, Del., March 27, 1888. After moving to New York City in 1848, he was commissioned to illustrate Irving's *Rip Van Winkle* (1849) and *Legend of Sleepy Hollow* (1850) and soon became famous for his book

illustrations. He brought out in separate publications *Compositions in Outline from Judd's Margaret* (1856); *The Cooper Vignettes* (1862); and *Compositions in Outline from Hawthorne's Scarlet Letter* (1879); and made illustrations for publications of the works of Longfellow, Dickens, and Shakespeare.

Darley was elected to the National Academy of Design in 1852. In 1859 he married Jane Colburn and in the same year moved to Claymont, Del. A trip he took to Europe in 1868 was documented in *Sketches Abroad with Pen and Pencil* (1868). Although Darley displayed excellent workmanship in all his drawings, he is best in depicting the American scene.

DARLEY, George, Irish poet, critic, and mathematician: b. Dublin, Ireland, 1795; d. London, England, Nov. 23, 1846. He wrote a series of mathematical texts (1826-1828); a lyrical drama, *Sylvia, or the May Queen* (1827), admired by Coleridge; two cantos of a poem, *Nepenthe* (1839), and two tragedies. His best story, "Lilian of the Vale," appeared in the *London Magazine* in 1826.

DARLING, dār'ling, Charles John, 1st BARON DARLING, English jurist and writer: b. Colchester, England, Dec. 6, 1849; d. Lymington, May 29, 1936. After his call to the bar in 1874, Darling was active on the Oxford circuit until his appointment as judge in 1885, the same year in which he ran unsuccessfully for Parliament as a conservative from South Hackney. Three years later he was returned for Deptford and kept his seat until his appointment to the High Court bench in 1897. Knighted in that year, Darling had a successful, if not distinguished, career as jurist, and the year following his retirement in 1923, he was raised to the peerage. Darling's courtroom behavior often manifested his sense of humor and literary interests. Among his writings are *Scintillae Juris* (1877); *Meditations in the Tea Room* (1879); *Seria Ludo* (1903); *On the Oxford Circuit and Other Verses* (1909); *Musings on Murder* (1925); *A Pensioner's Garden* (1926); *Reconsidered Rimes* (1930); and *Autumnal Leaves* (1933).

DARLING, Flora Adams, American author and founder of patriotic societies: b. Lancaster, N. H., July 25, 1840; d. New York, N. Y., Jan. 6, 1910. The wife of Edward Darling, a Confederate officer killed in the Civil War, Mrs. Darling, with Mrs. Mary S. Lockwood, founded the Daughters of the American Revolution (q.v.) on Oct. 11, 1890. After a quarrel with the national board, she resigned, and out of the New York Chapter, she formed, on Aug. 20, 1891, another organization, the Daughters of the Revolution. On Jan. 8, 1892, she founded the Daughters of the United States of the War of 1812. Her writings include *Mrs. Darling's Letters, or Memories of the Civil War* (1883); *A Winning Wayward Woman* (1889); *A Social Diplomat* (1889).

DARLING, Grace Horsley, English heroine: b. Bamfborough, England, Nov. 24, 1815; d. Oct. 20, 1842. She was the daughter of the keeper of the Longstone Lighthouse. The event which made her famous occurred on Sept. 7, 1838. The steamer *Forfarshire* was wrecked near the lighthouse, and at daylight William

Darling described the wreck from Longstone, but, accustomed to scenes of danger as he was, shrank from attempting to reach the steamer through a boiling sea in a boat. His daughter, who could see, by the aid of a glass, the sufferers clinging to the wreck, implored him to let her accompany him in the endeavor to relieve them. At last he consented; and father and daughter reached the wreck, and found nine sufferers, whom they succeeded in bringing to the lighthouse. The news of the heroic deed soon spread, and a purse of \$3,500 was quickly subscribed and presented to the brave girl.

DARLING (so called from SIR RALPH DARLING, a governor of New South Wales), a name of several applications in Australia. (1) The Darling River, a river rising in southeast Queensland, is formed by the junction of several streams, and flows through New South Wales in a south-westerly and southerly direction till it joins the Murray at Wentworth on the border of Victoria. It has a drainage basin of about 200,000 square miles, mainly arid, except for a strip on either bank. (2) Darling district is a pastoral district about 50,000 square miles in extent, in the southwest of New South Wales, and watered by the Darling and the Murray. (3) The Darling Downs are a rich tableland west of Brisbane in Queensland, forming excellent pasture and arable land. It is well watered, and measures about 6,000 square miles. (4) The Darling Range, granite mountains in Western Australia, running in a northerly direction parallel with the coast from Point D'Entrecasteaux for nearly 250 miles. Its highest peaks do not exceed 1,500 feet.

DARLINGTON, James Henry, American Protestant Episcopal bishop: b. Brooklyn, N. Y., June 9, 1856; d. Aug. 14, 1930. Graduated at New York University, 1877 and the Princeton Theological Seminary, 1880; he became assistant in 1882 and from 1883 to 1905 was rector of Christ Church, Brooklyn. In 1905 he became first bishop of Harrisburg. He was lecturer at New York University, 1902-03 and chaplain of the Masonic Grand Lodge of Pennsylvania, 1910-15. He edited *The Hymnal of the Church; In Memoriam; Little Rhymes for Little People*; and wrote *Pastor and People* (1912); *Verses by the Way* (1923-29); composer of *The Sea and the Sea Gulls* (1929).

DARLINGTON, England, a municipal and parliamentary borough in Durham County nine miles west-southwest of Stockton-on-Tees. It is well built, chiefly of brick, and nearly in the form of a square, and has among its public buildings an ancient Gothic church with a lofty spire, founded in 1160, and restored in 1865. The woolen manufacture is carried on to a considerable extent; there are important iron and steel manufactures; also the locomotive works of the North Eastern Railway are located here. The town is on the old Stockton and Darlington Railroad, which was the first line in England on which locomotive steam-engines were used. The borough returns one member to the House of Commons. Pop. (1951) 84,861.

DARLINGTON, S. C., town and Darlington County seat; alt. 175 feet; 10m. NW. of Florence; on the Atlantic Coast and Seaboard

railroads. It is a tobacco and cotton market; manufactures textiles, chairs, veneers; famous for its laurel oaks. The Pee Dee Experiment Station, specializing in field crops, is nearby. Settled in 1798; incorporated 1835. Pop. (1940) 6,236; (1950) 6,619

DARLINGTONIA, a genus of pitcher-plants, belonging to the family *Sarraceniaceae*. *D. californica* grows in the northern part of California, chiefly in the district around Mount Shasta. It is found in boggy places on the slopes of mountains. It entraps insects, which are attracted to the curious pitcher or hood at the extremity of the tubular leaves; and, once inside, the insects are prevented by the fine hairs which point downward from returning. Sometimes the pitchers at their base are filled to the depth of four or five inches with insect remains. The larva of a small moth *Xanthoptera semicrocca* preys on the plant, and that of a dipterous insect, *Sarcophaga sarraceniae*, feeds on the dead insects which it encloses. See also CARNIVOROUS PLANTS.

DARMESTER, Agnes Mary Frances Robinson, English poet: b. Leamington, England, Feb. 27, 1857; d. Aurillac, France, Feb. 9, 1944. She was a Greek scholar, her verse showing the influence of Hellenic literature. In 1888 she married James Darmesteter (q.v.), Orientalist, who died in 1894, and in 1901 she married Émile Duclaux, director of the Pasteur Institute in Paris. Her writings include *A Handful of Honey-suckle* (1878); *The Crowned Hippolytus, from Euripides* (1881); *Arden*, a novel (1883); *Emily Brontë* (1883); *An Italian Garden* (1886); *The End of the Middle Ages: Essays and Questions in History* (1888); *Songs, Ballads and a Garden Play* (1888); *Lyrics* (1891); *Retrospect* (1893); *Life of Renan* (1897); *A Mediaeval Garland* (1897); *Collected Poems* (1901); *The Return to Nature* (1904); *The French Ideal* (1911); *Twentieth Century French Writers* (1914); and in French, *Marguerites du Temps Passé* (1892); *Froissart* (1897); *Grands Écrivains d'Outremanche* (1901); *La Vie de Émile Duclaux* (1907); *Victor Hugo* (1924); *Life of Racine* (1925); *Portrait of Pascal* (1927).

DARMESTER, därm'stë-târ', James, French Orientalist: b. Château-Salins, March 28, 1849; d. Maisons-Lafitte, near Paris, Oct. 19, 1894. He was of Jewish parentage; received his education at The Lycée Bonaparte, Paris; and became professor of Zend at the École des Hautes Études. In 1885 he became professor of Iranian languages and literature at the Collège de France. In 1886 he went to India where he spent several years at philological research, and became fellow of Bombay University. He succeeded Renan as secretary of the Société Asiatique de Paris and edited a prominent journal, *La Revue de Paris*. Besides works of strict scholarship on the Oriental literatures, as *Ormuzd and Ahriman* (1877); *Iranian Studies* (1883); *Origins of Persian Poetry*, he wrote many essays on miscellaneous subjects. There is an English translation of some of his *Selected Essays*.

DARMSTADT, därm'stät, Germany, capital of the Republic of Hesse, near the

Darm River 104 miles southeast of Cologne (Köln). It consists of an old and a new town. The former, which is the business part of the town, is very poorly built; the houses are old, and the streets are narrow and gloomy. The new town, until 1918 the residence of the grand duke of Hesse-Darmstadt, is laid out with great regularity and has handsome squares and houses. On the handsome Luisenplatz is the old palace, which contains a library of 564,000 volumes and some 4,000 manuscripts; there, too, is a statue of Grand Duke Louis I, who founded the new town. A picture gallery has some good examples of the early German and Dutch masters; the finest of the works is the *Madonna of the Burgomaster Meyer*, by Hans Holbein the Younger. Among other buildings of note are a museum of natural history, a Roman Catholic church patterned after the Pantheon, the new palace, and the Rathaus (town hall), built in 1580. The Herrngarten is a fine public garden and park. The school of agriculture and the engineering department of the technical high school are of importance. Darmstadt is an important industrial city. Besides machinery and iron goods, manufactures include carpets, chemicals, scientific instruments, tobacco, hats, playing cards, and beer. Justus von Liebig, the distinguished chemist, was born here in 1803. In the 11th century Darmstadt, then known as Darmundstadt, was no more than a village. It acquired municipal rights in 1330, and in 1479 it passed by marriage into the possession of the Hesse family. The old castle was destroyed in the Schmalkaldic War (1546-1547), and in 1567 Darmstadt was made the capital of Hesse-Darmstadt. French forces burned the town in 1688 and again in 1693, but by the end of the 18th century it had attained great prosperity. On March 26, 1945, during World War II, Darmstadt was occupied by United States troops. Pop. (1939) 115,526.

DARMSTADTER UND NATIONALBANK, a financial institution in Germany prior to July 1931, when it was compelled by economic conditions to suspend operations. It had been formed in 1922 by a merger of the Bank für Handel und Industrie (popularly known as the Darmstadter Bank) with the Nationalbank für Deutschland. The Bank für Handel und Industrie was established at Darmstadt in 1853, but its important activities did not commence until 1856. Originally it was exclusively an institution for the promotion of industry, and relatively unimportant as a bank for the emission of state, communal, and railroad securities. Its charter was modeled after that of the *Crédit Mobilier*, and in many respects its policy coincided with that of the *A. Schaafhausen'scher Bankverein*. The Nationalbank für Deutschland was founded in 1881 and subsequently absorbed the Deutsche Nationalbank, in Bremen, and the Holsten Bank, in Neumünster. The Darmstadter und Nationalbank had a capital in 1928 of 60,000,000 Reichsmarks, and reserves amounted to 55,000,000 Reichsmarks. In association with an international group, it formed the Internationale Bank te Amsterdam.

DARNEL, dār'nēl, the popular name for *Lolium temulentum*, an annual grass which some suppose to be the *Infelix lolium* of Virgil and the *Zisania* (tares) of Scripture. It was believed

by the ancients to be poisonous and narcotic. It is common in waste places and fields in North America from New Brunswick to Georgia and northwestward to Michigan. It is remarkably abundant on the Pacific Coast and is generally a troublesome weed. It has been naturalized from Europe. It has been shown that its poisonous properties are due to a peculiar fungus that almost always infests the seed.

DARNLEY, dār'nli, LORD (HENRY STEWART or STUART), Scottish nobleman, second husband of Mary, Queen of Scots: b. Temple Newsam, Yorkshire, Dec. 7, 1545; d. Edinburgh, Feb. 10, 1567. He was the eldest son of Matthew Stewart (1516-1571), 4th Earl of Lennox (see under STUART family); his mother, Lady Margaret Douglas (1515-1578), was the daughter of Margaret, sister of Henry VIII of England, and thus he was one of the possible successors to the English throne after the death of Queen Elizabeth. In 1560, following the death of Francis II, the French king who was the first husband of Mary, Queen of Scots, he was sent to France by his mother, who envisaged his marriage with the widowed Scottish queen. She, however, returned to France, and he went back to England where, with his mother, he was imprisoned for a brief period in 1561 on the orders of Elizabeth. He became reconciled with the English queen, and early in 1565, at the request of Mary, he was permitted to go to Scotland. Darnley, though devoid of real merit, had, by his personal attractions, won Mary's heart, and political considerations also persuaded her to marry him. The marriage was celebrated in the abbey adjoining Holyrood, the royal palace at Edinburgh, on July 29, 1565, but it proved to be an unfortunate match. Coolness was succeeded by an open quarrel, and finally by deadly hate. He was jealous of the political influence of David Rizzio (q.v.), who had arranged the marriage but became haughty and overbearing, and Darnley thought, or affected to think, that Mary's regard for Rizzio was of a kind which no husband ought to tolerate. In 1566 he joined with James Douglas, 4th Earl of Morton, Patrick Lindsay, 6th Baron Lindsay of the Byres, and other nobles in a conspiracy for the murder of Rizzio, and was one of those who dragged him from the queen's supper table and stabbed him to death under circumstances of horrid barbarity. Soon, however, Mary persuaded Darnley to betray his companions to her, and as a result he was left without any loyal supporters. He decided to go abroad, but was prevented from doing so by a series of circumstances. He was once more estranged from his wife, and he refused to attend the baptism of their son at Stirling in December 1566; the infant became James VI of Scotland and James I of Great Britain, and thus Darnley was the ancestor of British monarchs from 1603. A plot to get rid of Darnley was hatched by a number of the queen's friends, among them, almost certainly, being James Hepburn, 4th Earl of Bothwell (eventually the queen's third husband). Darnley fell ill at Glasgow, possibly as the result of being poisoned, and as he was recovering Mary, with whom he was again seemingly reconciled, accompanied him to Edinburgh and installed him in an isolated house called Kirk o' Field (belonging to a retainer of Bothwell), which stood at some distance from Holyrood. In the early hours of Feb. 10, 1567, while

Mary was absent attending some festivities, the house was blown up with gunpowder. The dead bodies of Darnley and his page were found in a field at a distance of 80 yards from the house, quite free from any mark which such an explosion would cause; supposedly, they were strangled.

DARROW, Clarence (Seward), American lawyer: b. Kinsman, Ohio, April 18, 1857; d. Chicago, Ill., March 13, 1938. He was admitted to the Ohio bar in 1878 and practiced in Ash-tabula until 1888, when he removed to Chicago. There he developed into one of the leading lawyers in the United States, particularly skilled in criminal cases. In 1894 he resigned as general counsel for the Chicago and Northwestern Railroad because of his sympathy for strikers during the Pullman strike, and acted as member of the counsel for Eugene V. Debs in the case for conspiracy that followed. During 1902-1903 he served as chief counsel for the miners in government arbitration of the anthracite coal strike at Scranton and Philadelphia, Pa., and he also appeared in numerous other celebrated cases. Among these was that, in 1906, of Moyer, Haywood, and Pettibone, charged with complicity in the murder of former governor Steunenburg of Idaho; and the case in 1911 of the McNamara brothers accused of dynamiting the building of the Los Angeles Times. In 1924 he was counsel for the defense in the trial of Loeb and Leopold in Chicago for the murder of Bobby Franks; and in 1925 he appeared for John Thomas Scopes, of Dayton, Tenn., charged with violating the state law forbidding the teaching of evolution in publicly supported schools and colleges. Although he retired from regular practice in 1927, he assumed the defense in 1932 of Negroes charged with rape in the Scottsboro case. Besides *Farmington*, an autobiographical novel, he wrote *Crime, its Cause and Treatment* (1925); *The Story of My Life* (1932); and, with Wallace Rice, *Infidels and Heretics* (1933).

DART, a javelin, a short missile weapon thrown by the hand or impelled by the breath, through a tube. Dart heads are usually made of iron but among savage nations flints, sea shells, fish bones, and other hard substances have been employed; and among some aborigines the dart was merely a sharp-pointed stick, the end of which was carbonized by fire. The weapon is always very simple in its construction, and is usually from three to five feet long.

DARTER, a name given to water birds of a small family (Anhingidae), found in the southern United States, Africa, Asia, and Australia. The American species (*Plotus anhinga*), also called the snakebird and water turkey, is especially common in Florida, and extends northward to North Carolina and Illinois. In appearance and habits the darter resembles the cormorant, especially in the structure of the feet, wings, and tail; the bill and neck are like those of the heron, the neck, owing to a peculiar anatomical mechanism, being remarkably flexible. The general color of the body is dark glossy green with silvery gray markings; wings and tail are bluish-black. The tail is rather long and consists of 12 narrowly wedge-shaped quills. Their haunts are in low swampy localities, by the side of murky streams. They generally perch

on trees whose branches dip into the water. They are the best fresh-water divers known, and drop into the water with such surprising skill that the large body makes scarcely any noise, and but little ripple on entering the water. In swimming, its body is submerged, and the only part visible is the long neck, writhing about like an aquatic serpent, whence it derives its name of snakebird. Its food consists of small fish, shrimps, young reptiles, and leeches. The quantity of fish it can consume is enormous; but, like other birds feeding on fish and flesh, it can remain several days without food with impunity. It captures fish, not by diving upon them from above, but by pursuing them under water and spearing them with its closed beak. A bulky nest of sticks and roots is placed in a tree and receives three or four white, chalky eggs.

DARTERS, small fresh-water fishes forming a subfamily of the Percidae, from the typical members of which they are distinguished by having the pseudobranchiae (opercular gills) imperfect or absent, the margin of the gill cover smooth, and the skull less perfectly ossified. They have been described as perches reduced in size and compacted. The *Etheostomatinae* are peculiar to North America, where 15 genera and about 80 species occur, mostly in rocky rills and clear mountain brooks too small to be occupied by other fishes. They are among the smallest of fishes, some of the species being less than two inches, and the largest—the so-called log perch (*Percina caprodes*) of the Great Lake region and Mississippi Valley—only six to eight inches long. The typical and commonest genus is *Etheostoma*. The darters spend most of their time resting on their fins on the bottom, hiding beneath stones or partially buried in the sand, leaving only the eyes uncovered. Owing to the protective resemblance of their often brilliant markings to the bottom, they are difficult to distinguish. When disturbed, most of the species dart for a short distance with the greatest rapidity, and again settle on the bottom in a quiescent state.

DARTFORD, town, England, in Kent, situated on the Darent 15 miles east-southeast of London. The first paper mill in England was built here, in 1590, by Sir John Spielman (d. 1607), Queen Elizabeth's jeweler. Paper is still manufactured in Dartford, and other products of the town include chemicals, locomotives, and machinery. There is an ancient parish church, and a grammar school which was founded in 1576. Here, in 1331, a famous tournament was held by Edward III; the Augustinian nunnery which that king founded in Dartford in 1355 later became a residence for Henry VIII, for Anne of Cleves, his fourth wife, and for Queen Elizabeth. Saint Edmund's chantry, part of Edward III's endowment to the priory, was a celebrated place of pilgrimage on the road to Canterbury. Dartford was the scene of the outbreak of the Peasants' Revolt, an insurrection led by Wat Tyler in 1381. Pop. (1931) 28,928.

DARTMOOR, an extensive, rugged, mountainous tract in England, in the western part of Devonshire, often called the "Forest of Dartmoor," but at present having no appearance of a forest, except what is afforded by some

dwarf oaks, intermixed with ash and willow, reaching from Brent south to Okehampton north, 22 miles, with a breadth of about 20 miles, and occupying about 140,000 acres. In the center of the moor there is an extensive swamp in which the rivers Dart, Teign, Taw, Yealm, Erme and a great number of smaller streams have their source. Cattle and sheep are fed on the coarse grass during the summer months. In the winter the storms from the Atlantic sweep over it and it would be difficult to imagine a more desolate-looking place. Several of the rugged granite hills (here called "tors") are of considerable height, Yes Tor rising 2,028 feet and High Willhays 2,039 feet above the plain. The district is noted as being the site of a prison built at Princetown in 1806 for the custody of the French prisoners of war. At one time it contained 10,000 inmates. Since 1850 it has been maintained as a prison for English convicts. Experiments made in cultivating the moor by convict labor have turned out to be successful. The quarries to the west of the prison also give employment to convict labor. The large kaolin works and a meteorological observatory are at Lee Moor. Dartmoor offers considerable attraction to the tourist and naturalist. Druidical and other aboriginal remains may be traced, especially Gray Wethers, a sarsen which is thought to have been a Druidical temple.

DARTMOOR MASSACRE. The, April 6, 1815. During the War of 1812 the American naval prisoners of the British, with impressed American seamen discharged from British vessels, were collected at Dartmoor military prison. On March 31, 1815 they numbered 5,693, including about 1,000 Negroes. They had heard of the Peace of Ghent, Dec. 24, 1814, and expected immediate release; but the British government refused to let them go on parole or take any steps till the treaty was ratified by the United States Senate, Feb. 17, 1815. It took several weeks for the American agent to secure ships for their transportation home and the men grew very impatient. On April 4, a dishonest food contractor attempted to work off some damaged hardtack on them in place of soft bread. They rebelled and he was forced to yield. The commandant, Capt. Thomas G. Shortland, suspected them of a design to break jail. This was the reverse of truth in general, as they would lose their chance of going on the carts; but a few had made reckless threats of the sort and the commandant was very uneasy. About 6 P.M. of the 6th he discovered a hole from one of the five prisons to the barrack yard near the gun-racks. Some prisoners were outside the guard railing noisily pelting each other with turf, and many more near the breach (and the gambling tables), though the signal for return to prisons had sounded. Convinced of a plot, he rang the alarm bell to collect the officers and have the men ready. This luckless precaution brought back a crowd just going to quarters; just then a prisoner broke a gate-chain with an iron bar and a number pressed through to the prison market square; and after attempts at persuasion, Shortland ordered a charge which drove indoors part of the prisoners. Those near the gate, how-hooted and taunted the soldiery, who fired volley over their heads; the crowd yelled and threw stones, and the soldiers, prob-

ably without orders, fired a direct volley which killed and wounded a large number. Then, losing their heads, they followed the throng of prisoners struggling frantically to get within the prison doors, shooting them down as they went, some even firing within doors; others ran up to the walls and fired into the fleeing knots below. Finally the captain, a lieutenant, and the hospital surgeon (the other officers being at dinner) succeeded in stopping the murder and caring for the wounded, of which there were about 60, 30 seriously, besides seven killed outright. The affair was examined by a joint commission, Charles King for the United States and Francis S. Larpent for Great Britain, who agreed in exonerating Shortland, justifying the first firing, blaming the subsequent one and pronouncing the culprits undiscoverable. The British government provided for the families of the killed, pensioned the disabled and promoted Shortland.

Consult Andrews, Charles, *The Prisoners' Memoirs, or Dartmoor Prison* (New York 1852); Cobb, E., *Green Island's First Cruise, Together with Five Months in Dartmoor* (Boston 1841)

DARTMOUTH, city, Nova Scotia, Canada, located on the eastern side of Halifax Harbor, on the Canadian National Railway. It was founded by British settlers in 1750 and was for a number of years the scene of a whale fishing industry established by a colony of Nantucket Quakers after the American Revolution. It was the first town to be incorporated in Nova Scotia. The present city is connected with Halifax by ferry (municipally owned and operated) as well as by two scenic highways. It has a fine waterfront with facilities for shipbuilding and repairing. Beyond the city limits are large sugar and oil refineries, and a Royal Canadian Air Force (R.C.A.F.) station is located further east at Eastern Passage. Remains of the old locks of the Shubenacadie Canal, built to connect the Bay of Fundy with the Atlantic Ocean add to the interest of a beautiful chain of five lakes commencing in the town and extending for many miles into the country. Dartmouth has a board of trade, a hospital, and 2 banks. Pop. (1941) 10,847.

DARTMOUTH COLLEGE, an institution of higher learning in Hanover, N. H., which received its royal charter from George III in 1769 and opened its doors the following year under the presidency of Eleazar Wheelock, D.D. It was the direct outgrowth of Moor's Indian Charity School established by Dr. Wheelock in 1754 for the education of Indians at Lebanon (now Columbia), Conn. In 1766-1768 the Rev. Samson Occom, Dr. Wheelock's first Indian pupil, and the Rev. Nathaniel Whitaker through personal solicitations in England raised an endowment fund of £12,000, the largest sum of money received by a colonial educational institution from the mother country in pre-Revolutionary days. These funds enabled Dr. Wheelock to enlarge the scope of his school and to seek a new location nearer the Indian tribes. From numerous proposed sites he selected the town of Hanover, on the Connecticut River, and from the Province of New Hampshire received grants of land totaling 44,000 acres. Governor John Wentworth, whose role in the founding was second only to that of Dr. Wheelock, chartered the institution as a college, which was

named after the second earl of Dartmouth, president of the Indian school's board of trustees in England. The new college was chartered for white youths as well as Indians, was made non-sectarian, and was placed in full control of an American board of trustees. The Indian school, separately chartered a few years later, gradually became superfluous but remained a preparatory department of the college until 1849. Its legal existence ended in 1915, when by court decree it was consolidated with the college.

In 1770 Dr. Wheelock removed his family and school, consisting of 18 whites and 6 Indians, from Lebanon to the wilderness of Hanover, where the colony lived in log huts. For the college motto Dr. Wheelock chose *Vox clamantis in deserto*—"The Voice of One Crying in the Wilderness." The first class of four students was graduated in 1771, since which year the college has never failed to have an annual graduating class. President Wheelock retained his office until his death in 1779, and was succeeded by his son, John Wheelock. The new president, armed with letters of introduction from General Washington, Benjamin Franklin and John Adams, went to Europe in 1782 to promote the interests of the college, and in 1784 a start was made upon Dartmouth Hall, the first college building of any pretensions. After a presidency of 36 years, Wheelock was removed from office by the trustees in 1815. This act, growing out of a local religious controversy, led to a conflict with the State legislature. That body claimed the right to amend a charter of which it was the guardian, and in 1816 passed acts creating a new corporation and changing the title of the college to Dartmouth University. The college trustees brought suit for the recovery of the college property. (See DARTMOUTH COLLEGE CASE.) It was in this famous case that Daniel Webster, a graduate of Dartmouth in 1801, acted as attorney for the college and succeeded in getting from the United States Supreme Court a decision denying the right of the New Hampshire state legislature to violate the college charter. Since then Dartmouth has remained a private institution.

Dartmouth College still remains an institution for men only. Besides the undergraduate college proper, which offers a liberal arts curriculum and grants only the Bachelor of Arts degree, it comprises the Dartmouth Medical School, founded under Dr. Nathan Smith in 1797; the Thayer School of Engineering, founded in 1870 by General Sylvanus Thayer, Dartmouth graduate and famous head of the United States Military Academy; and the Amos Tuck School of Administration and Finance, founded in 1900 by Edward Tuck of the class of 1862 as a memorial to his father, of the class of 1835. Dartmouth has never departed from its chosen sphere of the undergraduate college of liberal arts, and the three graduate schools of medicine, engineering and business which have grown up have been kept small and wholly consonant with the limits within which the college has chosen to carry on its work. Down to 1892 the college remained a small institution, with an average enrolment of 300 men. Since then its growth has been rapid, the trustees setting a limitation of 2,000 students in 1919 and later allowing this to increase to the present limitation of 2,500 men. Since its first com-

mencement in 1771 the college has graduated some 25,409 men, of whom 17,874 are now living. It has a faculty of 275 men, a library of 700,000 volumes, a plant valued at \$8,500,000, and endowment funds of \$29,000,000.

CHARLES E. WIDMAYER,
Director of the News Service, Dartmouth College.

DARTMOUTH COLLEGE CASE, The.

The Dartmouth College Case is the name by which is commonly known the action entitled *Trustees of Dartmouth College v. Woodward*, which is repeated in volume four of Wheaton's *United States Supreme Court Reports*. Perhaps no decision ever rendered in any tribunal has attracted more attention or exerted a greater influence over the legislative and judicial history of our land than has the decision in this case, which arose as follows:

In the year 1769 the Rev. Eleazar Wheelock, aided financially and politically by friends in England and America, conspicuous among whom was the Earl of Dartmouth, and with the assistance of the Province of New Hampshire, given in the form of extensive land grants, founded Dartmouth College under a charter from King George III of England. This charter vested the control of the institution in a board of trustees, who were designated by Mr. Wheelock to manage the same, and under the management of those trustees so incorporated and their successors the college grew and prospered until the year 1816, when the state legislature passed an act amending its charter by which they curtailed the power of its trustees, changed its name to Dartmouth University and made it a State institution subject to state control. For protection against this infringement of their powers, the trustees had recourse to the courts.

In the state tribunals the decision went against the college trustees and an appeal was taken to the Supreme Court of the United States, the appeal being based upon the theory that the charter granting the control of the college to the trustees was a contract, that under Section X of Article 1 of the Federal Constitution no state can pass an act impairing the obligation of any contract, and that the said act of the New Hampshire legislature violated the contract of the charter of Dartmouth College.

It should be remembered that in 1819 when the case came up for final hearing, the popular views of the scope and effect of the National Constitution were far from harmonious. All then regarded that instrument as the greatest existing governmental compact, but the Republican party then in power demanded that it be so strictly construed as to preserve unimpaired the rights and powers of the individual States. On the other hand, there then presided over the Federal Supreme Court Bench, in the person of John Marshall, one of the "midnight appointees" of John Adams, the last President of that Federalist party which demanded so liberal a construction of the instrument as to give the country a strong national government. Of the section of the Constitution invoked, we may safely say with Ordronaux that "Drafted at a time when commerce was in its infancy; when public credit was depreciated to the lowest ebb; and confidence in monetary transactions almost destroyed, it was manifestly introduced as a

barrier against the tide of repudiation which threatened to overwhelm both public and private credit." The framers of the Constitution never intended that clause to be given the interpretation urged in this case. But the case was up before a court presided over by the jurist who has been truthfully said to have "found the Constitution a skeleton and clothed it with flesh and blood." Therefore, when it was clearly shown, as it was in the celebrated argument of Daniel Webster for the college trustees, that this case came fairly within the provisions of that section, in principle, the court, guided by John Marshall, held that the act of the New Hampshire legislature was void because it impaired the obligation of a contract. Justice Duvall alone dissented.

This decision has perhaps been more severely criticized and has perhaps given rise to more strenuous efforts to escape its consequences than has any other decision of the tribunal which rendered it, and the reasons are obvious. While it gave assurance that capital invested in chartered business and charitable ventures would be forever protected from legislative interference, it also invited political corruption by saying in effect to promoters of corporations that the courts would protect them in the possession of every concession or right which they beguiled from pliant legislative bodies. It made possible the mechanical and industrial achievements of the 19th century in this country, but it also made profitable the limitless corruption which has attended those achievements and which has frequently, by virtue of this decision, stripped the government of very important powers.

But the correctness of a judicial decision is not to be gauged by its influence for weal or woe. Rather should that be determined by its conformity to the Constitution, the statutes and the judicial precedents upon which it rests and the approval given it by later decisions. Judged by this test we must hold that Marshall and his colleagues decided well in the Dartmouth College Case. The Supreme Court of the United States had early laid down the rule that there are certain vital principles of republican government which will overrule a flagrant and apparent abuse of legislative power. It had in the year 1810 declared a law granting land to private companies to be in effect a contract which could not be so repealed as to impair the obligation of that contract. If the passage of the law were procured by fraud the court there doubted its power to declare it void for those reasons, but if that power existed it could be exercised only under those rules of law and equity which govern private transactions. Two years later there came before the same court a case involving a somewhat similar question. The State of New Jersey had traded land with an Indian tribe and had, by legislative enactment, provided that the Indians should forever hold the lands received by them free from taxation. With the consent of the State they sold their lands and, the question being properly presented, the court held that the law granting the exemption was a contract, that the exemption ran with the land and that the purchasers from the Indians enjoyed the same exemption.

By the decision in the Dartmouth College Case the rules laid down in the foregoing cases were followed and their application extended to contracts in charters of incorporation, but their

force when so applied had already been limited by another line of decisions. In 1804 Chief Justice Marshall, speaking for the court, had said that the charter gives to a corporation all of the powers it possesses and no powers not granted can be exercised. A little later he had decided that there is a difference between a grant of corporate existence and a grant of peculiar remedies. The first is general. The second can only be exercised in those courts which the power bestowing the privilege can regulate. Moreover, as the bank charter involved in that case contained a clause making it a felony to counterfeit its notes, the court believed it to be a public act and subject to repeal by succeeding legislatures. And in the year 1819 the same court had decided that the right to use a peculiar form of attachment granted in its charter to a bank could be taken away at any time because "The forms of administering justice and the duties and powers of the courts as incident to the exercise of a branch of the sovereign power must ever be subject to the legislative will and the power over them is inalienable so as to bind subsequent legislatures."

It is thus made fully apparent that the Dartmouth College Case decided only that if a legislative grant, whether made in the form of a charter of incorporation or in any other form, conveyed to private citizens that which the legislature had power to contract away, the grant so made was a contract and no succeeding legislature could rescind the same without following the same rules which govern the rescission of private contracts. But if there is any doubt that such was the understanding of the chief justice who wrote the opinion of the court in that case, the same will be removed by a consideration of certain later decisions in which he participated. In the year 1821 the court over which he presided decided that Congress had power to incorporate a lottery to do business beyond the limits of the District of Columbia, yet, where no mention was made thereof in the charter, it would not be presumed that Congress had done so and had thereby deprived the States of their power to regulate lotteries by preventing the sale of tickets within their boundaries. In the same year the same court decided that a town government cannot contract away its legislative power. And in the case of *Providence Bank v. Billings*, the court presided over by Marshall decided that while a State might, through its legislature, grant immunity from taxation, it could not be presumed to have done so, and that, in the absence of any agreement to the contrary, it might tax to death a franchise which it had itself granted.

But the effect of the Dartmouth College decision was not fully understood at the time of its rendition and the States eagerly availed themselves of a suggestion found in the decision itself to the effect that if they wished the right to amend, alter or repeal charters granted by them they must expressly reserve that power. Such a reservation, whether expressed in the charter itself, the Constitution or the general laws of the State, has been held to have the effect of "placing the State legislature back on the same platform of power and control over the charter containing it, as it would have occupied had the constitutional restriction never existed." Yet the later decisions hold that this reserve power must be reasonably exercised.

The alterations must be made in good faith and consistent with the objects and scope of the act of incorporation. Sheer oppression and fraud cannot be inflicted under the guise of amendment or alteration. This power cannot be so employed as to defeat or substantially impair the object of the grant or any right which has become vested under it. Where the power has been reserved, a state may tax property which it has forever exempted from taxation, but the taxes must not be greater than those imposed upon other property. It can regulate the charges of common carriers, but no such legislation must amount to the taking of private property for public purposes without due process of law. We thus see that not only was the Dartmouth College decision as moderate as any of the later cases which have been said to have practically overruled it, but that even where reservations in charters have obviated the effect of that decision the later courts have reached a similar conclusion by a different chain of logic.

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S. V. WRIGHT.

DARU, dà-rü', COMTE (PIERRE ANTOINE NOEL MATHIEU BRUNO), French statesman: b. Montpellier, France, Jan. 12, 1767; d. Becheville, near Meulan, Sept. 5, 1829. He served in the French Revolutionary armies, was a member of the Tribunal (1802), counselor of state, intendant general of the Grand Army in Austria (1805 and 1809) and in Prussia (1806–1807), and secretary of state from 1811 until Napoleon's abdication in 1814. In 1819 he became a member of the Chamber of Peers. He wrote histories of Venice and Brittany, and published a translation of Horace.

D'ARUSMONT or **DARUSMONT**, Frances. See WRIGHT, FRANCES.

DARWAR. See DHARWAR.

DARWEN, dār'wën; dār'ën (formerly OVER DARWEN), municipal borough, England, in Lancashire, about 17 miles northwest of Manchester. The chief industries are cotton milling and the manufacture of paper, plastics, machinery, paint, and soap. There are coal mines and stone quarries in the neighborhood. Pop. (1951) 30,827.

DARWIN, dār'wîn, Charles Robert, English naturalist: b. Shrewsbury, England, Feb. 12, 1809; d. Down, Kent, April 19, 1882. His father, Robert Waring Darwin, was a distinguished physician, the son of the still more distinguished Erasmus Darwin (q.v.). He exhibited an interest in natural history from an early age, and as a medical career was then the common outlet for such interests, he was quite naturally sent to the University of Edinburgh for preparation in that field. There he made significant friendships

with the professors interested in the natural sciences, but he found himself temperamentally unfitted for a career as physician and surgeon. With the idea of preparing for the church, he transferred to Cambridge University. Darwin took his degree, in 1831, with no special distinction.

The reputation that he had gained at Cambridge earned for the young Charles Darwin the post of naturalist on H.M.S. *Beagle*, which sailed on a circumnavigation of the globe in December 1831. During the voyage more than four years were spent on the coasts of South America. Inland trips from various ports gave Darwin an acquaintance with the extraordinary animal life of the continent, to the discovery of which was added the profound impression made by the fossils of gigantic extinct creatures found on the coastal cliffs of Patagonia. Before setting sail for Tahiti and New Zealand, the expedition spent five weeks among the Galapagos Islands. The remote yet distinct relations between the animal life there and in South America, and the differences in the land animals from island to island, made a profound impression on Darwin's mind. His observations throughout the voyage, and above all the stimulus to further observation, laid the foundations for his thinking about the transmutation of species, and thus about the whole problem of evolution, which was to occupy his mind for most of the rest of his life.

The direct products of the voyage were a popular account of his experiences and impressions under the title *Journal of Researches into the Geology and Natural History of the various countries visited by H.M.S. Beagle* (1839); *Structure and Distribution of Coral Reefs* (1842); *Volcanic Islands* (1844); and *Geological Observations* (1844–1846). The *Journal* had an immediate and continued success. It is usually known simply as *A Naturalist's Voyage on the Beagle*, and remains a classic among books of travel.

In 1839 Darwin married his cousin Emma Wedgwood, and after three years in London they settled in a country house at Down, where their two daughters and five sons were brought up.

An entry in his diary in 1837 shows that Darwin in that year opened a notebook on the transmutation of species. This subject (which involves the whole idea and process of evolution) occupied him increasingly, with only a few friends in his confidence, for 22 years. His activities during these years bore more or less directly on the problems of evolution. He took up the study of the barnacles of the world, and many years of study made him an authority on this remarkably modified group of crustaceans and led to the publication of four monographs on them. A characteristic story of this era tells that one of the Darwin boys, being shown through the house of a neighbor by one of his playmates, inquired at the end, with evident astonishment, "But where does your father do his barnacles?"

Another activity that helped to fill Darwin's secret notebooks was pigeon breeding, which included active membership in the pigeon breeding associations of London. Equally important was his secretaryship of the Geological Society of London (1838–1844), which threw him into close association with Sir Charles Lyell (q.v.). The reading of Thomas Robert Malthus' *Essay on the Principle of Population* in 1838 had suggested to Darwin how in an overcrowded world a natural selection of adaptations of all kinds was possible,

and this idea became the central theme (but not the exclusive one) of his theory of the origin of species, which he sketched out roughly in 1842 and at greater length in 1844. The years of study in preparation for the public announcement of his views came to an abrupt end in June 1858 when he received a manuscript from a young naturalist, Alfred Russel Wallace (q.v.), then in the Malay Archipelago, with a request for his opinion. Wallace had been struck by the very same conception of natural selection and survival of the fittest that formed the core of Darwin's theories. Sir Charles Lyell and Sir Joseph Hooker, Darwin's principal scientific confidants, insisted that he prepare an abstract of his own ideas to accompany the Wallace manuscript, and both were presented at an historic meeting of the Linnaean Society of London, July 1, 1858. Darwin began to write his momentous work immediately thereafter; and with this advance advertisement of what was to be a major scientific controversy, the entire edition of *On the Origin of Species by Means of Natural Selection, or the Preservation of Favoured Races in the Struggle for Life* sold out on the day of publication, Nov. 24, 1859.

In scientific circles the new ideas gained almost immediate acceptance in Britain, America, and on the Continent. Darwin's book presented a reasonable explanation of a possible mode of transformation of species by natural causes, as opposed to the doctrine of special creation of all species and their immutability. Equally important, however, was his summary of the evidences for evolution in general from all sources; and it is now apparent that with the mass of evidence provided by the extensive fossil discoveries made since the era of Georges Cuvier at the beginning of the century, acceptance of evolution was long overdue. The *Origin* served as a catalyst, or like a crystal of a substance dropped into a supersaturated solution.

The violent popular controversy that raged over evolution for a decade, and persists with vestiges in the mid-20th century, resulted from the supposed conflict between religion and evolutionary ideas. In this controversy Darwin took little part; evolution was championed in public by able colleagues like Thomas Henry Huxley in England, Asa Gray in America, and Ernst Haeckel in Germany. For the subsequent strictly scientific controversy over natural selection see DARWINIAN THEORY.

Two of Darwin's later works were essentially amplifications of his evidence and arguments in the *Origin of Species*. These were *The Variations of Animals and Plants under Domestication* (1868), and *The Descent of Man, and Selection in Relation to Sex* (1871). The other principal works reflect the kinds of study, observation, and gathering of materials carried on at Down: *On the Various Contrivances by which British and Foreign Orchids are Fertilized by Insects* (1862); *On the Movements and Habits of Climbing Plants* (1864); *The Expression of the Emotions in Man and Animals* (1872); *Insectivorous Plants* (1875); *The Effects of Cross- and Self-Fertilization in the Vegetable Kingdom* (1876); *The Different Forms of Flowers on Plants of the Same Species* (1877); and *The Power of Movement in Plants* (1880). The last book, *The Formation of Vegetable Mould through the Action of Worms, with Observations on Their Habits* (1881), which appeared the year before his death, is a memorial of the importance of the common

things that lie about us and an example of the significant scientific observation possible in one's own backyard with no other equipment than tenacity of interest and a notebook. This book forms the best of beginnings for a reading of Darwin's works. Facsimile editions of the first editions of the *Journal of Researches* (1952) and the *Origin of Species* (1950) are now available. The best edition of the latter for reference is the 6th (1872).

At the time of Darwin's death there was no longer any controversy over his greatness as a man of science, and he was buried in Westminster Abbey with scarcely an echo of the controversies of 1860.

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KARL PATTERSON SCHMIDT,
Chief Curator of Zoology, Chicago Natural History Museum.

DARWIN, Erasmus, English physician and poet: b. near Newark, Nottinghamshire, England, Dec. 12, 1731; d. at Breadsall Priory near Derby, April 18, 1802. The grandfather of Charles Robert Darwin and Sir Francis Galton (qq.v.), he practiced medicine at Lichfield, 1757-1781, and thereafter at Derby. He is chiefly remembered for his poem *The Botanic Garden* (1791), embodying the botanical system of Carolus Linnaeus (q.v.). Part 2 was originally published as *The Loves of the Plants* (1789); part 1, added in 1791, was entitled *The Economy of Vegetation*. His *Zoonomia* (1794-1796) anticipated the laws of organic life on the evolutionary principle later expounded as Lamarckism (q.v.).

DARWIN, Sir Francis, English botanist: b. Down, Kent, England, Aug. 16, 1848; d. Cambridge, Sept. 19, 1925. The son of Charles Robert Darwin, he was his father's biographer and under the title *Foundations of the Origin of Species* (1909), edited two essays written by him in 1842 and 1844. Although he qualified as a physician at St. George's Hospital, London, he did not practice. After assisting his father in his work at Down, he was made reader in botany at Cambridge, where he had graduated. His principal work as a botanist was in the field of vegetable physiology; his writings on the subject included *Practical Physiology of Plants* (with E. Hamilton Acton, 1894). He was knighted in 1913.

DARWIN, Sir George Howard, English astronomer: b. Down, Kent, England, July 9, 1845; d. Cambridge, Dec. 7, 1912. He was the second son of Charles Robert Darwin. In 1883 he was appointed Plumian professor of astronomy at Cambridge University, where he did notable research on the effects of tidal friction and the evolution of the solar system. A collected edition of his writings was published as *Scientific Papers* (4 vols., 1907-1911). He was knighted in 1905.

DARWIN, city, Australia, capital and principal seaport of Northern Territory, situated 97 feet above sea level on a fine natural harbor. A railway extends 316 miles south to Birdum. The climate is tropical. Exports include pearl shell, *bêche-de-mer* (trepang), fish, peanuts, and meat. An important Allied base in World War II, the town and harbor works were severely bombed by

the Japanese in 1942. Rebuilding after the war included a modern airport and new port facilities. The city, founded in 1872 as a telegraph station, was originally called Palmerston and later renamed for the great naturalist Charles Darwin. Pop. (1953 est.) 7,697.

DARWINIAN THEORY. Commonly referred to as "natural selection," or Darwinism, the Darwinian theory is one of the explanations proposed to account for the evolution of plants and animals, and particularly for their evident adjustment to the requirements of their environment. The publication by Charles Darwin of the *Origin of Species by Means of Natural Selection, or the Preservation of Favoured Races in the Struggle for Life* in 1859 had an importance far beyond its presentation of an explanation of evolution, for it caused general acceptance of the theory of evolution itself. From this fact there arose, in the minds of those not familiar with the history of biology, a natural confusion between Darwinism as such and the much broader concept of evolution as creation by natural causation, whatever the process.

Darwin's Theory.—It is important to note, in the title of Darwin's work, that he was concerned primarily with the explanation of the diversity of animal and plant life, and only secondarily with the progress from simple to complex which, in the nonscientific mind, has come to be the principal association of the word evolution. Progressive advance is implicit in the evolution of living organisms, but this is overlain and complicated by the adjustments to feeding, locomotion, shelter, and breeding habits, which are renewed at every level. It is this adjustment or adaptation that is most immediately explained by natural selection.

Darwin observed the great individual variation of the species of plants and animals, and the enormous overproduction of young. The variations most likely to survive from one generation to the next, passing through the great sieve of mortality of excess juveniles, would be those best adapted to the environment. This process of selection by the environment he compared to the artificial selection and elimination practiced by man among his domestic animals, which have produced the astonishing variety of races of dogs and pigeons, domestic fowl, and cattle. Long continuance of the process of natural selection would gradually perfect the adaptation of wild animals and plants to their needs in special conditions of life, and thus lead to the transformation of ancestral types and to the multiplication of types adapted to the great variety of environments offered in nature. Darwin's friend and contemporary, the philosopher Herbert Spencer, coined the appropriate phrases "survival of the fittest" and "struggle for existence."

Darwin never regarded natural selection as the exclusive factor in evolution. In later editions of the *Origin of Species* he recognized more fully the importance of additional factors, such as supposed inherited effects of use and disuse, direct effects of the environment, and "variations which seem to us in our ignorance to arise spontaneously." To his own theory Darwin added the corollary of sexual selection; he conceived that selection of those males best able to defeat others in their competition for females, or those best able to attract the females (and vice versa), must be an additional factor resulting in the grad-

ual transformation of species, and particularly in the acquisition and diversification of secondary sex characters, such as the horns and other weapons exclusive to the male, and differences of coloration and behavior. This theory is incorporated in the *Descent of Man, and Selection in Relation to Sex* (1871). It did not escape Darwin that the evolution of the social insects involves the selection of whole populations, not of individuals and that the evolution of the much modified and specially adapted sterile castes of the bee, ant, and termite societies cannot be through the inheritance of acquired characters.

Neo-Darwinians and Neo-Lamarckians.—The weakness of evolutionary thought during Darwin's lifetime lay in the lack of knowledge of heredity. It was not known that many of the variations theoretically effective for natural selection are not inherited; and Darwin's own theory of pangenesis (q.v.) was ill-conceived and short-lived. Darwin's followers were much more dogmatic as to the exclusive importance of natural selection. Alfred Russel Wallace argued in *Darwinism* (1889) that all of the distinctive features of plants and animals must be of use to the organism, however obscure that usefulness may seem to the human observer. August Weismann's contribution to the theoretical basis of inheritance (especially in *Das Keimplasma*, 1892) lay in the demonstration that the germ cells are effectively isolated from the environment, since they differentiate early in the development of the organism and are thus removed from all direct relations with the environment during the life of the adult. Natural selection was left as the sole means of impressing change on the successive generations of organisms.

The older ideas, dating from Buffon and Lamarck, that the environment has a direct influence on the structures of organisms and that changes of environment have an effect on the use and disuse of their structures by organisms, received considerable attention from a school of biologists who thought of themselves as neo-Lamarckian, as the school of Weismann was neo-Darwinian. But with continuity of the germ plasm established and environmental influence thus excluded, there seemed to be no positive factor left to influence or direct evolution, and natural selection came to be thought of as purely negative, as eliminating the unfit but of no effect in producing progressive adaptation or directed change.

Contemporary Theory.—At this juncture in the history of evolutionary thought, in the early years of the 20th century, the nature of inheritance was illuminated by the discovery of mutations and by the rediscovery of the work of Gregor Mendel showing how the inheritance of the established characters of plants and animals takes place. It was at first assumed that the random mutations (or changes) in characters, appearing by chance in individual specimens among the populations of a species of plant or animal, were of an order of such importance that natural selection must be relegated to a minor role in evolution. During the period of enthusiastic development of the new science of genetics, interest in evolution was at an ebb. When it was gradually learned that mutations govern variation at precisely the level of minute variation observed by Darwin and postulated in the ideas of natural selection, it was possible to return to the examination of the mechanisms of evolution

armed with a wholly new understanding of the basic processes of inheritance, and to what is essentially a synthetic theory of evolution.

It is the hope of the group of synthesists that the evidences of evolution in the classification of plants and animals, in their comparative anatomy, and in their paleontological history, can be brought into harmony with genetic facts and processes and theories. At the heart of this synthesis is a re-establishment of natural selection as the crucial factor; but natural selection is now seen in perspective as bearing upon the spread of mutations through populations, and as bearing upon the elimination and favoring of whole populations rather than of individuals. As the science of genetics has matured, increasing interest has developed in the nature of the differences between wild species, in the rate of change of populations, and in the internal and external factors that segregate a changed population from an unchanged ancestral one. The importance in evolution of the relations of plants and animals to their environment has been increasingly recognized.

Interest in man's own evolution has led to active studies of the evolution of behavior, to study of human heredity, and to much thought as to the significance of mind and language and societies and group behavior. Important discoveries of human fossils have helped to bridge the gap between archaeology and paleontology. See also DARWIN, CHARLES ROBERT; ENVIRONMENT; EVOLUTION, ORGANIC; GENETICS; HEREDITY; NATURAL SELECTION.

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KARL PATTERSON SCHMIDT,
Chief Curator of Zoology, Chicago Natural History Museum.

DAS, dās, Chitta Ranjan, Indian political leader: b. Calcutta, India, Nov. 5, 1870; d. Darjeeling, June 16, 1925. Member of a high (Baidya) family, he was educated at the University of Calcutta and in England, where he was admitted to the bar in 1894. He practiced law in Calcutta until 1919 when he gave up his lucrative practice to work actively with the Nationalist Party for Indian independence and soon became a political leader in Bengal. In December 1921, shortly before he was to preside at the Indian National Congress in Ahmadabad, he was arrested for his political activities and was sentenced to six months in prison. He presided at the National Congress meeting at Gaya in December 1922; and in 1923, with Motilal Nehru, organized the Bengali Swaraj (self-rule) Party. In April 1924 he became the first popularly elected mayor of Calcutta.

Das had founded the monthly *Narayana* in 1915, but was better known as the founder and editor of the Swarajist daily newspaper *Forward*. He published a volume of poems, *Malancha*, in 1895, and was the author of *India for Indians* (1918), a volume of *Speeches* (1918), and *The*

Way to Swaraj (1923). He was opposed to the parliamentary practices of the West and believed that India should be organized politically on the basis of cooperative semiautonomous village centers, with the central power merely advisory and with political freedom for all classes.

DASENT, dā's'nt, Sir George Webbe, English Norse scholar: b. St. Vincent, British West Indies, May 22, 1817; d. Ascot, England, June 11, 1896. Educated at Westminster School and Oxford University, he became secretary to the British envoy at Stockholm, Sweden, in 1840, and began his lifelong study of ancient Scandinavian literature, publishing his translation of *The Prose or Younger Edda* in 1842. Returning to England in 1845, he became assistant editor of *The Times*, a connection that continued until 1870. He was called to the bar in 1852 and became professor of English at King's College, London, in 1853. His *Popular Tales from the Norse* appeared in 1859, followed by *Saga of Burnt Njal* in 1861.

In 1862 Dasent visited Iceland and in 1866 published *Gisli the Outlaw*, considered the best of his Icelandic translations. In 1873 he supplied a preface to the Icelandic-English dictionary edited by Guthbrandur Vigfússon, and in 1874 published *Tales from the Fjeld*. He resigned from *The Times* in 1870 to become a Civil Service commissioner, and was knighted in 1876. Retiring from public service in 1892, he undertook his last work, a translation of *The Orkneyinger's Magnus and Hacon's Sagas*, completed in 1894 and published as volumes 3 and 4 of the 4-volume *Icelandic Sagas Relating to the British Isles*. His autobiographical novel *Annals of an Eventful Life* was published in 1870.

DASHEEN, dā-shēn', or **TRINIDAD DASHEEN**. A root crop with no erect stem but with a cluster of large leaves from 4 to 6 feet, the dasheen is an especially rich-flavored, mealy-cooking, and prolific variety of the Polynesian and Oriental taro (*Colocasia esculenta*), and one of the few edible members of the arum family (Araceae). The name dasheen is probably a contraction of *taro de Chine*. Cultivated in Egypt and India from remote antiquity, dasheens were introduced as a potato substitute in the southern United States in 1913 and are now widely grown in tropical Africa as coco yam or eddoes, and elsewhere in the tropics in many varieties differing in shape, size, color of the flesh of the tuber, degree of acidity, food value, and cultural requirements. The large tubers contain an acrid substance which is irritating to the digestive tract, but this is lost through cooking or repeated washing. The flesh is mealy, has a nutty flavor, and contains about 50 per cent more carbohydrates and proteins and less water than potatoes. In the Far East and Polynesia taros and dasheens, next to yams, constitute the staple food of millions of people.

THEODOR JUST.

DASHIELL, dā-shēl, John Frederick, American experimental psychologist: b. Southport, Ind., April 30, 1888. Educated at Evansville (Ind.) College and Columbia University, he taught psychology and philosophy at Princeton, the University of Minnesota, Oberlin, and elsewhere, and in 1920 became professor of psychology at the University of North Carolina. He is well known for his studies in learning, cooperative

thinking, and social factors in speed and accuracy of work. His published works include *Fundamentals of Objective Psychology* (1928); *An Experimental Manual in Psychology* (1931); *Fundamentals of General Psychology* (1937; revised 1949); and articles on experimental psychology. He has contributed numerous articles to THE ENCYCLOPEDIA AMERICANA.

DASHKOVA, dūsh-kó'vū, PRINCESS Ekaterina Romanovna, Russian woman of letters: b. St. Petersburg (now Leningrad), Russia, March 17, 1743; d. on her estate near Moscow, Jan. 4, 1810. Daughter of Count Roman Vorontsov, she was married at 15 to Prince Mikhail Dashkov and three years later was left a widow. She studied mathematics at the University of Moscow and played an active part in the conspiracy of 1762 that placed Catherine II on the throne of Russia. She did not remain on good terms with the empress, however, and in 1768 went abroad for many years, visiting Germany, France, Italy, and England, and meeting many eminent men of the day.

Upon her return to St. Petersburg in 1782 she was made director of the Academy of Arts and Sciences, and later that year president of the Russian Academy which she was instrumental in having founded along the lines of the French Academy. She planned a Russian dictionary, which the academy was to publish, and did some of the work on it herself, edited a monthly magazine, and wrote the plays *The Marriage of Fabian* and *Toissioff*. On the death of Catherine she was deprived of her offices and was compelled to leave the capital. Her *Memoirs*, written in French, were published in English in 1840.

DASS, dās, **Petter**, Norwegian poet and clergyman: b. on Nord Herø Island, Norway, 1647; d. 1707. The son of a Scottish father who had settled in Norway, he was educated for the clergy in Copenhagen, and in 1689 became pastor of a parish in Nordland Province, northern Norway, where the folkways and the scenery inspired much of his poetry. His poem *Den norske Dale-Vise* (*The Norwegian Song of the Valley*) was published in 1696, but most of his poems were circulated in manuscript and though widely known were not published until after his death. His most famous poem *Nordlands Trompet* (*The Trumpet of Nordland*) was published in 1739. Known and quoted by Norwegians of every class, it is vivid, imaginative, and touched with humor, and deservedly established Dass as "the father of modern Norwegian poetry," as he is called. His collected works were published in three volumes, 1874-1877.

DASSY or **DASSIE**, another name for the hyrax. See **HYRAX**.

DASYPROCTA, dās-ī-prōk'tā, a genus of agoutis (family Dasyproctidae), a group of rodent mammals inhabiting tropical America from southern Mexico to Paraguay and some of the West Indian islands. See **AGOUTI**.

DASYURE, dās-ī-ūr, any of a family (Dasyuridae) of marsupial mammals found only in Australia and New Guinea, particularly the marsupial "cats" (*Dasyurus* and related genera). Their size varies from that of a wolf to that of a mouse. The tail is well developed but never prehensile. There are usually five separate toes

on each foot, but in some forms the big toe of the hind foot (hallux) is absent. The marsupial pouch is often reduced or absent and if present is always directed backwards. The teeth are of a sharp cutting type, well adapted for masticating the flesh and insects upon which these animals feed.

Some 19 genera are currently recognized. The true dasyures, comprising some four genera and five species, are about the size and general build of skunks, but are brown with white spots. They feed on insects, small mammals, and birds. Closely related is the cat-sized Tasmanian devil (*Sarcophilus harrisi*), black with a few white patches. Stout in build, somewhat like a badger, and more markedly carnivorous in habit, it eats birds, small mammals, and reptiles. Largest of the Dasyuridae is the Tasmanian wolf (*Thylacinus cynocephalus*), very doglike in appearance and brown with black stripes running across the lower back. It feeds on wallabies and other mammals, including sheep, but has now become almost extinct.

The majority of the 13 remaining genera are usually called pouched mice, though some of them reach the size of a large rat. Less highly specialized for flesh eating, they appear to feed chiefly on insects. Most remarkable among them is the jerboa pouched mouse (*Antechinomys*), noteworthy for its greatly elongated hind legs on which it hops like a miniature kangaroo. Associated with this feature as specializations for desert life are the elongation of the ears and tail and the loss of the hallux.

More distantly related to the true dasyures, and often placed in a separate family, is the banded Australian anteater or numbat (*Myrmecobius fasciatus*). About the size of a rat, brown with white crossbars on the back, it has an elongate muzzle and a very long tongue which it uses for picking up food. This consists of termites which it obtains from rotten logs, the hollows of which are also used for shelter.

Unfortunately many of the dasyures have become greatly reduced in numbers as a result of the destruction of their habitats together with the introduction of rats, cats, and foxes from outside. See also **MARSUPIALIA**.

KARL KOOPMAN.

DATARY, dā'tā-rī, or **DATARIA**, dā-tā'rī-ā, an officer or office of the Curia Romana (q.v.) responsible for the correct dating and dispatch of certain papal documents, such as dispensations and appointments to church benefices. It is the duty of the Dataria to guard against possible errors of either dating or addressing documents, or in the tenor of the documents themselves.

DATE. See **CALENDAR**; **CHRONOLOGY**; **EPOCH**.

DATE or **DATE PALM** (*Phoenix dactylifera*), a species of palm (family Palmae) of considerable importance in low and middle latitude desert areas. The roughened trunk reaches a height of 80 feet or more, topped with a crown of leaves up to 15 feet long. Found nowhere wild today, its original home most probably was located near Mesopotamia, where Babylonians were believed to have grown it 8,000 years ago. It is now cultivated extensively in North Africa, Egypt, Syria, Iraq, Queensland (Australia), and northern India. A successful date industry has developed in southwestern United States, prin-

cipally in the Coachella Valley of California and the Salt River Valley of Arizona. Although the date palm will prosper in humid subtropical areas, good production will take place only where the summers are hot and dry. Considerable soil moisture is needed, however, since evaporation causes a loss of approximately 100 gallons of water a day from an average tree. Consequently, irrigation is necessary in most date-producing regions. Moderately alkaline, sandy soils are best, although the date palm will yield well even in heavy, silty ones.

Other parts of the tree aside from the fruit are useful. The trunk serves as timber, the leaves as thatch, and the leaf bases as fuel. The fiber is woven into ropes. In Europe the leaves are used symbolically in the observance of Palm Sunday and the Passover. Incisions made in the crowns of old, less productive trees yield a juice (sweet toddy) which when boiled down forms a thick brown sirup (gur) or sugar (jaggery), and when fermented forms an alcoholic beverage (arrack) or vinegar. Dates (the fruit) are eaten fresh or dried. The stones or pits are soaked in water or ground into meal and fed to camels, or are roasted as a substitute for coffee.

Extreme variability makes propagation by seed impracticable. Offshoots of useful varieties, however, will be identical with the parent plants. Unfortunately, only a limited number of offshoots are produced and these only by relatively young palms. Also, the mortality rate of transplanted offshoots may be high. Profitable production begins within six years and may continue for 100 years or more.

Normally, male and female flowers are borne on separate trees. In commercial plantations one male tree is planted for about 100 female trees. Since pollination by wind is unreliable, it is commonly effected by tying a branch with male flowers onto the female clusters in the crown of the tree. Individual flower clusters may have more than 10,000 individual yellowish blossoms. The fruit takes four and one half months to ripen after the flowering period in early spring. From 100 to 200 pounds of fruit per tree is an average yield. The fruit contains at least 60 per cent sugar, small amounts of fats and protein, a fair quantity of vitamin B₁, and lesser amounts of vitamins A and G. The varieties of fruit are classified into soft, semidry, and dry dates. Deglet Noor (semidry) is grown most extensively in California. Khadrawy (soft) and Saidy (soft) are also widely planted in the southwestern United States. Other popular varieties over the world are Halawy, Zahidi, Kustawy, Fard, and Thoory. Altogether, several hundred varieties are under cultivation.

HUGH N. MOZINGO,
Department of Biology, Florida Southern College.

DATE LINE. See INTERNATIONAL DATE LINE.

DATE PLUM. See PERSIMMON, or DATE PLUM.

DATE SHELL, a bivalve shell or its inhabitant of the genus *Pholas*, a kind of mollusk. It bores holes in clay, wood, soft rocks, and in some instances in hard stone, as in the columns from the Temple of Serapis which were brought from Africa to Italy. Species of the date shell are found in the Mediterranean and on both

shores of the Pacific, and their relatives are common along temperate and tropical seashores everywhere.

DATIA, dü'tî-ä, town, India, in Vindhya Pradesh, capital of Datu District, about 16 miles northwest of Jhansi. Hand-loom weaving is the chief industry, and there is trade in grains, cotton, and cloth fabrics. Formerly capital of the princely state of Datia (established about 1626; merged with Vindhya Pradesh in 1948), the town has a fine Hindu palace. Pop. (1951) 37,725.

DATISCIN, dä-tis'in, a crystalline glucoside C₂₇H₃₀O₁₅ extracted from the leaves and roots of the common garden plant, bastard hemp (*Datisca cannabina*). When pure it forms colorless silky needles which have a bitter taste and are readily soluble in alcohol, sparingly in ether and in water. It has feeble acid properties and with lead and tin forms yellow compounds which can be used as dyes. The derivative datiscetin crystallizes readily, is soluble in alcohol and in ether, almost insoluble in water, and gives a yellow dye when combined with lead.

DATIVE, dä'tiv (from the Latin verb *dare*, to give), in *grammar*, one of the cases of nouns and pronouns, the usual function of which is to mark the recipient of something given. In Latin, Greek, Sanskrit, German, and other Indo-European languages there are distinct forms for this case; but in modern English there is no distinct form, the objective case form of pronouns being used for this purpose. Thus, in such expressions as "Give me that," or "I gave the man a book," the indirect objects "me" and "man" may be thought of as datives.

In law, the term is used to designate something in one's gift or at one's disposal, as an office; removable, not perpetual, as an officer; appointed by a magistrate, as an administrator or executor.

DATO IRADIER, dä'tō ē-rä-thyēr', **Eduardo**, Spanish statesman: b. La Coruña, Spain, Aug. 12, 1856; d. Madrid, March 8, 1921. Educated at the University of Madrid, he practiced law in that city, and in 1883 was elected deputy to the Cortes as a Conservative. He became minister of the interior (1899-1900), under Francisco Silvela, and was active in promoting beneficial labor legislation such as accident insurance and laws for the protection of women and children in industry. He became minister of justice in 1902, and mayor of Madrid in 1907. As premier in 1913-1915 and again in 1917, he was largely responsible for the neutrality of Spain in World War I. In 1918 he was minister of foreign affairs. As premier again in 1920, he revived the Instituto de Reformas Sociales and also set up a ministry of labor. On March 8, 1921, in the course of the election disturbances of that year, he was assassinated by the explosion of a bomb thrown at the automobile in which he was riding.

DATOLITE, dä'tō-lit, a basic orthosilicate of boron and calcium. Its empirical formula is HCaBSiO₆; this may be written Ca(BOH)SiO₄. Datolite crystallizes in the monoclinic system, is brittle, has a hardness of 5 to 5.5, and a specific gravity of 2.9 to 3.0. It is characterized by its glassy, greenish, complex crystals, and easy fusibility and green flame before the blowpipe.

Datolite occurs mainly as a secondary mineral

in veins and cavities in basic eruptive rocks, often associated with calcite, prehnite, and various zeolites; also in gneiss, diorite, and serpentine; in metallic veins; and sometimes in beds of iron ore. It is found in Italy, Norway, and Tasmania. In the United States it is found with the diabase of the Connecticut River valley, in New Jersey, and in Michigan. The name, derived from the Greek *daitesthai*, means to divide, alluding to the granular structure of a massive variety. It is used as a gem.

ALVIN S. COHAN.

DATURA, dā-tū'rā (also known as STRAMONIUM, JIMSON WEED, THORN APPLE), a small genus of about 15 species of annuals, shrubs, and small trees, found throughout the tropics but chiefly in Central America, belonging to the nightshade family (Solanaceae). Like many members of this family, some daturas are very poisonous and have a long history as medicinals. The smaller species are weeds of wide distribution, and the larger ones are used as garden plants. The Old World species *D. metel* was known to the Greeks and Romans, and *D. stramonium* was introduced in Europe soon after Columbus. While the generic name is derived from the East Indian name dhatura, the common name Jimson weed is a contraction from "Jamestown weed," a name given by colonists who found the plant growing near Jamestown, Virginia. The name stinkweed refers to the unpleasant narcotic odor, especially of the bruised leaves.

Jimson weed (*D. stramonium*) is an annual over four feet tall with ovate, unevenly toothed, glabrous, strong-scented leaves; white or purplish funnel-form flowers; and hard, prickly, many-seeded capsules splitting in four valves. The Mexican and Central American species, *D. innoxia*, is a large, coarse, annual, freely-branching herb about three feet tall with densely pubescent leaves exuding a heavy, rank odor, and with white, funnel-shaped flowers. Its poisonous properties are due to the presence of alkaloids, mainly scopolamine ($C_{17}H_{21}O_4N$) found in the entire plant (*D. metel* and *D. innoxia*) and hyoscyamine (*D. stramonium*). The roots usually contain the smallest quantities of alkaloids, whereas leaves and seeds normally contain the largest. Both of these alkaloids are used in the treatment of nervous disorders. *D. innoxia* promises to become a commercial source of scopolamine, which is now being used as a pre-anaesthetic in surgery and childbirth, ophthalmology, and prevention of motion sickness.

Genetical studies with Jimson weeds have disclosed many chromosomal aberrations. Normally datura has 12 pairs of chromosomes, but some races have one or more supernumerary chromosomes or lack one of the regular complement. These aberrations affect characters of the entire plant.

THEODOR JUST.

DATURINE, dā-tū'rēen, a poisonous alkaloid found in the thorn apple (*Dature stramonium*), identical with hyoscyamine and isomeric with atropine.

DAUB, doup, Karl, German Protestant theologian: b. Kassel, Hesse, Germany, March 20, 1765; d. Heidelberg, Nov. 22, 1836. He was professor of theology at Heidelberg from 1795 on. The influence of the philosophy of Friedrich Wil-

helm Joseph von Schelling is evident in his *Theologumena* (1806) and *Einleitung in das Studium der Dogmatik* (1810); that of Georg Wilhelm Friedrich Hegel in *Die dogmatische Theologie jetziger Zeit* (1833), in which Daub endeavors to re-state Protestant dogma in terms of Hegelian idealism. His *Philosophische und theologische Vorlesungen*, 7 vols., was published posthumously (1838-1844).

DAUBAN, dō-bān', Jules Joseph, French painter: b. Paris, France, May 31, 1822; d. Château de Graveron (Gironde), 1908. A pupil of Auguste Hyacinthe Debay, he painted mostly historical and religious subjects. He became director of the museum and School of Fine Arts at Angers in 1849, and in 1868 received the decoration of the Legion of Honor. Among his works are *Reception of a Stranger by the Trappists* (1864), *Mme. Roland Going to the Revolutionary Tribunal* (1869), and six decorative compositions for the church at Quintin, Côtes-du-Nord Department.

DAUBENTON or d'AUBENTON, dō-bān-tōn', Louis Jean Marie, French naturalist: b. Monthard, Côte-d'Or, France, May 29, 1716; d. Paris, Jan. 1, 1800. He became assistant to the great naturalist Comte George Louis Leclerc de Buffon at the Jardin des Plantes (later the Muséum d'histoire naturelle) in 1742, and collaborated with him on *l'Histoire naturelle* (1749-1804), for which Daubenton prepared the anatomical descriptions of mammals. He became professor of zoology at the Collège de France in 1778, of rural economy at the École nationale vétérinaire d'Alfort in 1783, of mineralogy at the Muséum in 1793, and of natural history at the École normale in the same year. He was made a member of the Académie des sciences in 1760 and of the Institut de France, which temporarily displaced it, in 1795. Named senator in 1799, he served one term before his death.

DAUBENY, dō'bē-nī or dōb'nī, Charles Giles Bridle, English scientist: b. Stratton, Gloucestershire, England, Feb. 11, 1795; d. Oxford, Dec. 13, 1867. Educated in medicine at Oxford and the University of Edinburgh, he practiced intermittently until 1829, but his main interest lay in chemical, geological, and botanical research. In 1819 he toured France, making a special study of the Auvergne volcanic region, and after further study of European volcanoes, published his chief work *A Description of Active and Extinct Volcanoes* (1826; enl. ed., 1848). He visited the United States in 1837, and his *Notes of a Tour in North America* was privately printed in 1838. He was professor of chemistry at Oxford University (1822-1855), of botany (from 1834), and of rural economy (from 1840). Besides his work on volcanoes, his extensive writings on scientific subjects included *An Introduction to the Atomic Theory* (1831) and a pro-Darwinian paper, *On the Sexuality of Plants*, read before the British Association in 1860 and published in Daubeny's *Miscellanies* (1867).

D'AUBIGNE, Théodore Agrippa. See AUBIGNÉ, THÉODORE AGRIPPA D'.

DAUBIGNY, dō-bē-nyé', Charles François, French landscape painter and etcher: b. Paris, France, Feb. 15, 1817; d. there Feb. 19, 1878. He

studied under his father, a well-known miniature painter, and also in the studio of Paul Delaroche and in Italy. At the beginning of his career he did much book illustrating. As one of the "Men of 1830" group of French artists devoted to painting in the open air and directly from nature, Daubigny had considerable influence on the art of his day. For several years he used a houseboat as a studio, painting along the Seine and Oise rivers. His *Vue de Notre-Dame de Paris* was shown in the Salon of 1838, and he exhibited regularly thereafter. His large and impressive *Rising Moon* produced a sensation when it was shown in 1877. One of the best known of his paintings, *Sluice in the Valley of Oise* (1855), is in the Rouen Museum; his *Grape Gathering in Burgundy* (1863) is in the Louvre. American galleries and private collections have a number of his pictures: the Metropolitan Museum, New York City, has 10, and his *Springtime* (1857) is in the Museum of Fine Arts, Boston, Mass. A vigorous etcher, Daubigny produced more than 100 plates, marked by great frankness of method and a free, painterlike quality. He was made a chevalier of the Legion of Honor in 1859.

Consult Henriot, Fred, *Daubigny et son oeuvre gravé* (Paris 1875); Stranahan, Clara Cornelia Harrison, *History of French Painting* (New York 1888); VanDyke, John Charles, *Modern French Masters* (New York 1896); Wickenden, Robert John, *Charles François Daubigny, Painter and Etcher* (Boston 1914).

DAUBLER, doi'blër, **Theodor**, German writer: b. Trieste (then in Austrian possession), Aug. 17, 1876; d. St. Blasien, in the Black Forest, Germany, June 14, 1934. A leader of the expressionist school of writing in Germany. Daubler was educated in German and Italian schools and traveled widely in Germany, France, Italy, the Balkans, and the Orient before settling in Berlin. Much of his writing, especially his lyric poetry, is marked by mysticism and fantasy. The 3-volume epic poem *Das Nordlicht* (1910), his most important work, develops the theme that all life comes from the sun, and hence that the history of humanity is linked with that of the cosmos. Among his other works are *Der neue Standpunkt* (1916), art criticism: *Der heilige Berg Athos* (1923) and *Sparta* (1923); *L'Africana* (1928), a novel; *Der Fischzug* (1930); *Die Göttin mit der Fackel* (1931).

D'AUBUSSON, Pierre. See **AUBUSSON, PIERRE D'.**

DAUCUS, dô'kûs (from Greek *daukos* or *daukon*, a kind of carrot or parsnip), a genus of about 60 species of annual, biennial, or perennial herbs mainly of Mediterranean and African distribution, belonging to the parsley family (Umbelliferae). The biennial wild carrot (*D. carota*), Queen Anne's lace or devil's plague, is a weed of Asiatic origin but naturalized in America from Europe, growing in old meadows and pastures. Its erect, branched, bristly-hairy stem, usually about 5 feet high, rises from the fleshy taproot. The pinnately compound leaves are basal or alternate. The flowers are usually white or roseate to purplish and arranged in flat-topped compound umbels, with the central flower usually dark red or deep purple. The wild carrot cannot be transplanted to gardens or produce an edible product. Although not poisonous, it taints milk with a bitter flavor if cattle eat too much of it. When wet, the leaves may cause a dermatitis in some people.

The cultivated form, the edible carrot, is now regarded as a separate race (var. *sativa*) as it does not grow as a weed. Its orange-yellow root has a high food value, containing 88 per cent water, 9 per cent carbohydrates, about 1 per cent protein, a characteristic yellow pigment (carotin), oils, alkaloids, and more vitamins than most vegetables.

Another small species (*D. pusillus*) also occurs wild in southern United States from Florida to California.

DAUDET, dô-dâ', **Alphonse**, French novelist: b. Nîmes, France, May 13, 1840; d. Paris, Dec. 16, 1897. Paris was kind to Alphonse Daudet when, at the age of 17, he went there in quest of literary fame. The subtle charm of his personality earned him the favor of the salons and the protection of the duke of Morny, Napoleon III's half brother. For more than 30 years thereafter success smiled easily and broadly upon him. Within the loose bounds of the so-called naturalist school, together with Edmond de Goncourt and Emile Zola, he steered the younger literary generation toward a greater concern for factual documentation and social awareness. Yet, despite his happy associations in Paris, later evoked in reminiscent volumes (*Trente ans de Paris*, 1887; *Souvenirs d'un homme de lettres*, 1888), Daudet never lost his identity as a southerner. Not unlike his "kings in exile" (*les Rois en exil*, 1879), whose lives grow meaningless away from the land of their birth and power, he kept thinking of Provence as his spiritual habitat.

Fostered by his admiration for the Félibre, or neo-Provençal, movement (Frédéric Mistral, Joseph Roumanille, and others), his Mediterranean inspiration runs at its poetical best in the exquisite *Lettres de mon moulin* (1866). It turns to boisterous yet indulgent satire in the famed Tartarin trilogy (*Tartarin de Tarascon*, 1872; *Tartarin sur les Alpes*, 1885; *Port-Tarascon*, 1890). It waxes frankly nostalgic in the novels where Daudet uproots southern characters and plunges them into strange surroundings (*le Petit Chose*, 1868; *le Nabab*, 1877; *Numa Roumestan*, 1881; *Sapho*, 1884). It remains perceptible, negatively at any rate, whenever he depicts, in more or less Dickensian fashion, the depressing effects of modern city life, the manner in which it degrades the individual, distorts his perspective, and robs him of his very soul (*Fromont jeune et Risler aîné*, 1874; *Jack*, 1876; *l'Évangéliste*, 1883; *l'Immortel*, 1888).

Always relieved by a gentle sense of humor, always commingled with a deep, sympathetic understanding of human foibles, this sad vein tended more and more to supplant the joyous one of early years. The cause may be traced to the gloom attendant upon the French military defeats of 1870 (see *Contes du lundi*, 1873); but it is even more likely to lie in the progressive decline of Daudet's health. Excerpts from his unpublished diary, which appeared in 1931, contain some of the most moving and penetrating pages ever written on the subject of physical pain.

Consult Martinet, Yvonne, *Alphonse Daudet, sa vie, son oeuvre* (Gap 1940); Clugenson, Y. E., *Alphonse Daudet peintre de la vie de son temps* (Paris 1946). Also worthy of mention are affectionate testimonials by Daudet's elder brother, Ernest, a prolific writer in his own right (*Mon frère et moi*, Paris 1882); and by his son, Léon (*Alphonse Daudet*, 1898; *Quand vivait mon père*, Paris 1940); Saylor, G. R., *Alphonse Daudet as a Dramatist* (Philadelphia 1940).

J. A. BÉDÉ.

DAUDET, Léon, French writer and politician: b. Paris, France, Nov. 16, 1867; d. Saint-Rémy-de-Provence, July 1, 1942. The only son of Alphonse Daudet, he forsook medical studies at the age of 25 for a career in literature, journalism, and politics. His tremendous energy, applied to every type of writing including novels and criticism, found its natural outlet in the field of polemics. Shortly before the Dreyfus affair (see DREYFUS, ALFRED), he formed his lifelong association with Charles Maurras, foremost leader and exponent of the neoroyalist movement. Their friendship culminated in their codirectionship of the ultranationalist publication *l'Action française* when it became a daily in 1908. As a journalist for thirty years and as a deputy from Paris for a brief period (1919-1924), Daudet vituperated whatever and whoever seemed to him a byproduct of the French Revolution: "diseased" romanticism (as in his *le Stupide XIX^e siècle*, 1922), the "corrupt" republic, the parliamentary regime, Jewish "plutocracy," and so on. His attacks were often erratic and extremely virulent, but they made for great, masterful prose in the rowdy tradition of a certain type of French classicism, that initiated by François Rabelais. Indeed for sheer vividness, color, and truculence, Léon Daudet has few equals in French letters.

Consult Mas, Edouard, *Léon Daudet, son oeuvre* (Paris 1928); Clavière, M., *Léon Daudet* (Paris 1943).
J. A. BÉDÉ.

DAUGAVPILS, dou'gáf-pîls (Russian DVINSK; German DUNABURG), city, Latvia, USSR, on the right bank of the Western Dvina River opposite Griva, 120 miles southeast of Riga. A transportation center, it has railroad repair shops and foundries. The manufactures include machinery, hardware, and textiles. The city was founded by the Livonian Knights in 1278. From 1561 to 1772 it belonged to Lithuania-Poland, and in the latter year it fell to Russia in the partition of Poland. During World War I and the Russian Revolution much of it was destroyed. During Latvia's independence (1920-1940) it was the capital of Latgale Province. Pop. (1935) 45,160.

DAUGHERTY, dô'ër-tî, Harry Micajah, American lawyer and politician: b. Washington Court House, Ohio, Jan. 26, 1860; d. Columbus, Ohio, Oct. 12, 1941. After graduating from the University of Michigan, he practiced law in his native city for 12 years, moving to Columbus in 1893 where he practiced corporation law until his appointment as attorney general in 1921 by his close friend President Warren G. Harding. He had been instrumental in securing Harding's nomination for the presidency at the Republic National Convention in 1920 and had managed the subsequent successful presidential campaign. As attorney general he came under legislative criticism for alleged fraudulent dealings, particularly in the Teapot Dome oil scandal. After the death of Harding, he resigned from the cabinet (March 28, 1924) under pressure from President Calvin Coolidge; but in 1927, after disagreement by two juries, he was acquitted of federal charges of conspiracy to defraud the government. While in office he collected millions of dollars for the government in war fraud and prohibition cases, established the first federal prison for first offenders at Chillicothe, Ohio, and appointed J. Edgar Hoover chief of the Federal Bureau of Investigation. With Thomas Dixon he wrote *The Inside Story of the Harding Tragedy* (1932).

DAUGHTER OF THE CONFEDERACY. See DAVIS, VARINA ANNE JEFFERSON.

DAUGHTER OF THE REGIMENT. *The*, comic opera in two acts by Gaetano Donizetti (libretto by Jean François Bayard and Henri de St. Georges), first produced at Paris, Feb. 11, 1840. While in most of his operas Donizetti is pure Italian, in this he comes close to the French type of opera. With *Don Pasquale* and *L'Elixir d'Amore*, both of which are also comic operas, it forms the group of Donizetti's works which seem to possess the greatest vitality. The music is vivacious and sparkling, with a raciness born of the combination of the French and Italian manner. The deeper note is heard just enough to give the needed contrast, as in Marie's touching farewell song at the end of the first act, one of the finest melodies in Italian opera. The "Rataplan" duet between Marie and the Sergeant, recurring through the latter scenes, the Song of the Regiment, the romance in the second act with its amusing interruptions into the military spirit, and the rousing choruses are household favorites. It is one of those strange instances of erroneous first impression that the opera was not successful in Paris until after it had gone the rounds of the other European capitals. The role of Marie, the vivandière for whom the course of true love is so troubled, has always been popular with the great artists, such as Jenny Lind, Adelina Patti, Henriette Sontag, and Marcella Sembrich. Donizetti has always been famed as a writer of prima donna operas—a reputation not altogether undeserved. In *The Daughter of the Regiment* this claim, in its better sense, is well supported.

DAUGHTERS OF THE AMERICAN REVOLUTION, National Society, a society composed of women who are descendants of any ancestor who "with unflinching loyalty rendered material aid to the cause of independence as a recognized patriot, as soldier or sailor, or as a civil officer in one of the several colonies or States." It was organized in Washington, D.C., Oct. 11, 1890. Its objects are to perpetuate the memory of the spirit of the men and women who achieved American independence; to promote institutions for the general diffusion of knowledge; to cherish, maintain and extend the institutions of American freedom; to foster true patriotism and love of country; and to aid in securing for mankind all the blessings of liberty. In 1954 the society had a membership of 177,342, organized into 2,747 local chapters. The national headquarters are in Washington, D.C.

DAUGHTERS OF THE CONFEDERACY, United. See UNITED DAUGHTERS OF THE CONFEDERACY.

DAUGHTERS OF THE KING, The Order of, a Protestant Episcopal order of women (not to be confounded with the King's Daughters), organized in 1885. The aim of the society is to bring young women within the influence of the church and to cooperate with the rectors of parishes to that end. The office of the council is in New York. Its constitution is framed as far as possible on the terms of the Brotherhood of St. Andrew, the men's organization of the Protestant Episcopal Church to which it closely corresponds. In 1955 it had about 320 senior and 40 junior chapters, with a membership of 6,000.

DAULATABAD, dou-lât-â-bâd' (ancient DEOGIRI, dê-ô'gi-rî, or DEVAGIRI), village, India, in Hyderabad, about 8 miles northwest of Aurangabad, and known mainly for its ancient fortress built on a rock 600 feet high. The outer walls of the fortress, almost three miles in circumference, enclose the ruined palace, temple, and other structures of the early city, founded about 1187. The fortress was captured by the Moslems under Ala-ud-din (Khilji dynasty) in 1294. In 1339 Mohammed Tughlak (Taghlak) made the city his capital and gave it its present name. It came into possession of the nizâm of Hyderabad in 1707, after the death of the Mogul ruler Aurangzeb (Aurangzeb or Aurungzebe). The famous cave temples of Ellora (q.v.) are five miles northwest of the village.

DAULE, dou'lâ, town, Ecuador, in Guayas Province, on the Daule River, 25 miles north of Guayaquil, in an agricultural region raising rice, coffee, cacao, cattle, sugarcane, rubber, and tobacco. Industries are sugar and rice milling; cacao and coffee are exported. Mercury deposits are nearby. Pop. (1950) 4,697.

DAULIS, dô'lîs, town in Phocis, ancient Greece, about 12 miles east of Delphi, the setting for the myth of Philomela and her sister Procne who were changed into birds.

D'AULNOY or **D'AUNOY**. See **AULNOY** or **AUNOY**, **COMTESSE D'**.

DAUMER, dou'mêr, **George Friedrich** (pen name, **EUSEBIUS EMMERAN**), German philosopher and poet: b. Nürnberg, Germany, March 5, 1800; d. Würzburg, Dec. 13, 1875. Early attracted to Pietism, he next became anti-Christian, but about 1859 was converted to Catholicism. His philosophical treatise *Hints Toward a System of Speculative Philosophy* (1831) belongs to the early period; *The Fire and Moloch Worship of the Hebrews* (1842) to the second; and *My Conversion* (1859) to the third. Daumer's poetical works include *Flowers of Song from Hafiz* (1846-1851), a beautiful transcription of the verse of the Oriental poet with free variations.

DAUMIER, dô-myâ', **Honoré**, French artist: b. Marseille, France, Feb. 26, 1808; d. Valmondois, Feb. 11, 1879. His father, a glazier who had also published a small book of poems, hoped to keep him from becoming an artist by apprenticing him first to an usher in the Paris law courts and later to a bookseller. Though Daumier studied drawing for a short time under Alexander Lenoir, he was largely self-taught. He mastered the technique of lithography as a means of livelihood and began by making plates for music publishers and illustrations for advertisements. His lithographs attracted the attention of Charles Philippon, editor of *la Caricature*, and he soon joined the staff of that weekly. Fashion, gossip, scandal, politics, and oddities of character all inspired his genius for mockery. In 1832 he was imprisoned for six months and fined for his caricature of Louis Philippe as *Gargantua* devouring the heavy taxes of the people. *La Caricature* was suppressed in 1835, but Daumier continued to contribute to *le Charivari*, a daily which Philippon had founded in 1832. Here appeared his famous social caricatures known as the Robert Macaire series, named for a popular fictional hero

of the day. The biting, often savage satire with which he portrayed the follies and foibles of society and the personalities of the law courts was likewise displayed in his remarkable series *Parliamentary Idylls* and *The Representatives Represented*. He also depicted with tragic pathos as well as comic satire the ordinary people of Paris and various types in the theater.

At a public concourse after the revolution of 1848 Daumier exhibited his painting *La République nourrit ses enfants et les instruits* (*The Republic Fosters and Instructs Her Children*), now in the Louvre; and his canvas *Le Menuisier, son fils, et l'âne* (*The Miller, His son, and the Ass*), based on the La Fontaine fable, was shown in the Salon of 1849; but his lithographs so overshadowed his paintings that the latter attracted little attention during his lifetime. Not until the exhibition of his works held at l'École des Beaux Arts in Paris in 1900 did the public become aware of the scope of his genius and his great importance as a pioneer of realism. Today he is widely represented in the art museums of Europe and America. His *la Blanchisseuse* (*The Washwoman*) is in the Louvre; *Christ and His Disciples* is in the Rijksmuseum, Amsterdam; other pictures are in museums in Berlin, Bucharest, Rheims, The Hague, Montreal, Boston, and in other important collections. The Metropolitan Museum in New York has his *Third-Class Carriage* and *Don Quixote*.

Toward the end of his life Daumier's eyesight failed and by 1875 he was blind. He was generously assisted by his friends, especially by Jean Baptiste Camille Corot, who secured a pension for him from the French government and also gave him the little cottage at Valmondois where he died. A complete catalogue of his lithographs—about 3,958—was published by the firm of Hazard and Delfteil, Paris, in 1904. See also **CARICATURE**; **CARTOON**, **POLITICAL**; **PAINTING—Realism**; **PAINTINGS OF THE GREAT MASTERS—Daumier**: "*Third Class Carriage*."

Consult Alexandre, Arsène, *Honoré Daumier, l'homme et son oeuvre* (Paris 1890); Geoffroy, Gustave, *Daumier* (Paris 1901); Marcel, Henri, *Honoré Daumier* (Paris 1907); Sadleir, Michael, *Daumier, the Man and the Artist* (New York 1924); Cortissoz, Royal, *Personalities in Art* (New York 1925).

DAUN or **DHAUN**, doun, **COUNT Leopold Joseph Maria von**, Austrian army officer: b. Vienna, Austria, Sept. 24, 1705; d. there, Feb. 5, 1766. He fought in the Turkish campaigns (1736-1739), and distinguished himself in the War of the Austrian Succession (1741-1748). In 1754 he was made field marshal, and commanded the Austrian forces in the Seven Years' War (1756-1763). He defeated Frederick II at Kolín in 1757 and at Hochkirch the following year, and in 1759 forced the surrender of Gen. Friedrich August von Finck at Maxen. Frederick defeated him in 1760 at Torgau, where he was severely wounded. His military career ended with the signing of the Treaty of Hubertsburg, Feb. 15, 1763, concluding the Seven Years' War.

DAUNOU, dô-nôô', **Pierre Claude François**, French political leader: b. Boulogne-sur-Mer, France, Aug. 18, 1761; d. Paris, June 20, 1840. He joined the French Congregation of the Oratory in 1777 and 10 years later was ordained a priest, taking the oath to the civil constitution in 1790. In 1792 he was elected a deputy, representing his native Pas-de-Calais, in the

National Convention. He opposed the execution of Louis XVI and advocated his deportation pending a settlement. He was opposed also to the proscription of the Girondists and was imprisoned and escaped the guillotine only by the downfall of Robespierre. He was first president of the Council of Five Hundred and prepared a program of study for the central schools which was adopted in 1795. He was librarian of the Panthéon in 1801, and added to it the valuable collection of Pius VI. He was archivist of the empire in 1807 and founded the *Bibliothèque des Archives Nationales*. He edited the *Journal des Savants* after 1816. He wrote *Histoire littéraire de la France* and *Essai historique sur la puissance temporelle des papes* (1810).

Consult Taillandier, R., *Documents biographiques sur Daunou* (Paris 1841).

DAUPHIN, dô'fin, the title of the eldest son of the king of France. Dauphin was originally a title held by several of the feudal lords of France and is believed to have originated from the dolphins (Fr. *dauphin*) worn on their helmets or used as a family crest. In 1349 Humbert II, dauphin of Viennois, being childless, transferred his estate, called the Dauphiny (*le Dauphiné*), in the south of France, to Philip VI of Valois, on condition that the eldest son of the king of France should in future be styled the dauphin and govern this territory. The dauphin, however, retained only the title, the estates having been united with the crown lands. On the death of the dauphin his eldest son inherited this title; if he had no son his eldest brother succeeded him. If the king had no son, as was the case in the reign of Louis XVIII, the title of dauphin was not bestowed on any one; for it was never given to the next prince of the blood and presumptive heir, even if he were the king's brother. The wife of the dauphin was called dauphiness (*dauphine*). The *Delphin* classics (q.v.) were editions prepared for the use of the dauphin (*ad usum delphini*).

DAUPHIN, dô'fin, a rural municipality, Province of Manitoba, Canada, a tourist center on the Vermilion River near Dauphin and Clear lakes. It is a divisional point on the Canadian National Railway. Dauphin has a large community center, 8 churches, 4 schools, 3 banks, a hospital, and a weekly newspaper. Pop. (1946 census) 4,637.

DAUPHIN, Lake, a lake in the southwestern part of the Province of Manitoba, Canada, approximately 200 square miles.

DAUPHINE, dô-fē-nâ', one of the ancient provinces of France. It was divided into Upper and Lower Dauphiné. It comprised the departments of the Isère, the Hautes-Alpes, and Drôme. The capital of the whole was Grenoble. The province constituted a sort of triangle, bounded north by Burgundy, east by Savoy, south by Provence, and west by Languedoc. After the fall of the Roman Empire, it passed into the control of the Franks and eventually became part of the new Burgundian kingdom of Arles. From 1032 until the middle of the 14th century it was in the possession of Germany. It was bequeathed to France by the lords of the kingdom and for the next century was governed as a separate province by the eldest son of the king of France,

when it was finally made part of the kingdom of France. The Huguenots made this place their stronghold during the civil wars.

DAURAT, Jean. See DORAT, JEAN.

DAUTHENDEY, dou'tën-di, **Max**, German poet and playwright: b. Würzburg, July 25, 1867; d. Java, Sept. 4, 1918; descended from an old family of the nobility, which came to Germany from France and England in the 16th century. His father achieved some distinction as a pupil of Louis Daguerre in Paris and subsequently as court photographer in St. Petersburg. From that city he migrated to Würzburg where in 1867 his son was born. Of a highly imaginative disposition from his earliest childhood, young Dauthendey exhibited no little aptitude for painting, although his strongest inclination lay in the direction of poetry, to which he soon decided to devote himself. He never attended the university, but pursued his studies at the Gymnasium of his native city far enough to qualify for the shorter, one-year term of military service. An inveterate traveler, he visited Paris, England, and Sicily in 1896, Mexico the following year, Greece in 1898, and in 1906 made a trip around the world. The poetic chronicle of his impressions from these journeys is his *Die geflügelte Erde* (1910), which bears the subtitle *A Song of Love and the Wonders of the Seven Seas* and ranges from the fishmarket of Cairo to the skyscrapers of New York. Dauthendey is a lyricist of some originality and power, although it must be said that his earlier poems (*Ultra violette*, 1893), novels and plays (*Kind, Glück, Sehnsucht* 1895) are marred by excessive striving after a bizarre and fantastic virtuosity. After 1907 he produced a considerable bulk of poetry, of which the best is probably contained in his *Insichversunkene Lieder im Laub* (1908). Perhaps the most agreeable quality in his verse is his delicate nature-sense. His drama *Ein Schatten fiel über den Tisch* (1911) is a sordid exposition of marital infelicity. Among other collections of his lyrics and longer works are *Reliquien* (1899); *Liebeslieder* (1905); *Singsangbuch* (1907); *Lachen und Sterben*, two one-act plays (1911); and *Der Geist meines Vaters* (1912), which purports to be a history of his family.

WILHELM A. BRAUN.

DAUW, dou (*Equus burchelli*), an animal closely resembling the zebra, which inhabits the plains of central and eastern Africa, particularly to the north of the Orange River. It is about the size of an ass, but more delicately formed. Its general color is a pale brown, with grayish-white on the abdomen and inner parts of the limbs. Its head, neck, and body, and the upper parts of its limbs are striped like the zebra, but the stripes are not so dark in color. It migrates periodically in search of food, and in times of scarcity visits the cultivated lands and makes havoc of the crops. It has been tamed to some extent, but its temper cannot be relied on. The Dutch colonists call it *bonte quagga*. It is known also as Burchell's zebra after W. J. Burchell (1782-1863), English naturalist. See also **ZEBRA**.

DAVAO, dá'vou, province, Philippine Islands, in the southeastern part of the island of Mindanao; area 7,529 square miles. Most of the com-

munication between towns and villages is by sea. The capital is Davao. The province produces abacá (Manila hemp), coconuts, lumber, rubber, and pineapples, and has iron, gold, and sulphur deposits. Davao was occupied by United States troops in December 1899, and was given civil government in 1914. A Japanese invading force landed there in December 1941, but surrendered to Allied troops in 1945. Pop. (1939) city, 24,521; (1948) municipality, 111,263; province, 364,859.

DAVENANT, dāv'ē-nānt, **Charles**, English political economist: b. London, England, 1656; d. there, Nov. 6, 1714. Educated at Cheam grammar school and Balliol College, Oxford, he entered Parliament for St. Ives, Cornwall, was commissioner of the excise from 1678 to 1689, and sat for Great Bedwin in the parliaments of 1698 and 1700. He wrote a number of political tracts attacking ministerial abuses, but is chiefly distinguished as a pioneer of modern economic thought. Among his works on economic questions were *An Essay on the East India Trade* (1697); *Discourses on the Publick Revenues and of the Trade of England* (in two parts, 1698); and *An Essay upon the Probable Methods of Making the People Gainers in the Balance of Trade* (1699). From 1705 until his death he was inspector general of the exports and imports. His collected works were published in 1771.

DAVENANT, **John**, English clergyman and author: b. London, England, 1576; d. April 20, 1641. He was educated at Queens' College, Cambridge, of which he became a fellow in 1597, and master in 1614. In 1618 he was appointed one of four clergymen to represent the Church of England at the Synod of Dordrecht in Holland. In 1621 the king (James I) made him bishop of Salisbury, but in 1631 he offended the king and Archbishop William Laud by preaching before the court a Lenten sermon on predestination, a subject banned by royal order. He was brought before the council, but was dismissed without sentence. His most noted work was a commentary on the Epistle to the Colossians.

DAVENANT or **D'AVENANT**, **Sir William**, English poet and dramatist: b. Oxford, England, the latter part of February, and baptized March 3, 1606; d. London, April 7, 1668. He was educated at the Free School, Oxford, under Edward Sylvester, and became a page to the duchess of Richmond and later to Fulke Greville (Lord Brooke). He published his first play, *The Tragedy of Alborac, King of the Lombards*, in 1629, and subsequently wrote a number of successful plays, and several masques for the court. His comic masterpiece, *The Wits*, was first acted in 1633. On Dec. 13, 1638, following the death of Ben Jonson, he was appointed poet laureate.

In the hostilities between Charles I and Parliament, Davenant supported the royal cause and in 1643 was knighted by the king. When the royal army was defeated, he went to France where he became a Roman Catholic and began the composition of his principal non-dramatic work, a heroic poem entitled *Gondibert*. He attempted in 1650 to lead a French colony to Virginia for Queen Henrietta Maria of France, but the ship in which he sailed from Normandy was captured by a vessel in the service of the English Parliament and was taken to the Isle of Wight, where

Davenant was imprisoned. During this captivity he composed the third book of *Gondibert*. In October 1650 he was taken to London for trial, and the interposition of the poet John Milton is said to have saved his life. On the return of Charles II to England, Davenant became patentee of a theater in Lincoln's Inn Fields. The introduction of opera on the English stage and of women in female roles has been ascribed to him. He was buried in Westminster Abbey. His collected plays were published in five volumes at Edinburgh, 1872-1874.

DAVENPORT, dāv'en-pōrt, **Charles Benedict**, American biologist: b. Stamford, Conn., June 1, 1866; d. Cold Spring Harbor, N.Y., Feb. 18, 1944. He was educated at Brooklyn Polytechnic Institute and at Harvard (Ph.D., 1892), and after teaching for eight years at Harvard, was associate professor and curator of the zoological museum at the University of Chicago from 1901 to 1904. In the latter year he became director of the department of genetics and of the station for experimental evolution at the Carnegie Institute, where he remained until 1934; concurrently, from 1910, he was director of the Eugenics Record Office at Cold Spring Harbor. He served at various times on the editorial boards of the *Journal of Experimental Zoology*, *Genetics*, *Eugenical News*, and the *Journal of Physical Anthropology*, and in 1927 was president of the International Federation of Eugenics Organizations. His works include *Introduction to Zoology* with G. C. Davenport (1900); *Inheritance in Poultry* (1906); *Inheritance of Characteristics in Domestic Fowl* (1909); *Eugenics* (1910); *Heredity in Relation to Eugenics* (1911); *Heredity of Skin-Color in Negro-White Crosses* (1913); *How We Came by Our Bodies* (1936).

DAVENPORT, **Edward Loomis**, American actor: b. Boston, Nov. 15, 1815; d. Canton, Pa., Sept. 1, 1877. He made his first appearance on the stage in 1836 at Providence, R. I., as Parson Will in *Sir Giles Overreach*, with Junius Brutus Booth as Sir Giles, and soon became a leading performer. Up to 1847 he appeared chiefly in Boston, but in that year he went to England where he played Claude Melnotte in *The Lady of Lyons*, with Anna Cora Nowatt as Pauline. For two seasons he supported William C. Macready in London. In 1854 he returned to the United States, appearing principally in Shakespearean roles and in dramatizations of the works of Charles Dickens. In 1859 he became manager of the Howard Athenaeum in Boston, and in 1869 of the Chestnut Street Theatre in Philadelphia. He had nine children, seven of whom went on the stage and of whom the most famous was Fanny Davenport (q.v.).

Consult Moses, Montrose J., *Famous Actor-Families in America* (New York 1906).

DAVENPORT, **Eugene**, American educator and agriculturist: b. Woodland, Mich., June 20, 1856; d. there, March 31, 1941. A graduate of Michigan Agricultural College (1878), he was professor of agriculture there from 1889 to 1891. He spent the following year in São Paulo, Brazil, as president of the Agricultural College, and subsequently, in 1895, was appointed dean of the College of Agriculture and director of the Agricultural Experiment Station at the University of Illinois, where he remained until his retirement in 1922. He contributed notably to the agricul-

tural development of Illinois, his work in the field of soil fertility being of special importance.

DAVENPORT, Fanny Lily Gypsy, American actress: b. London, England, April 10, 1850; d. South Duxbury, Mass., Sept. 26, 1898. She made her first appearance on the stage in Boston in 1857 at the Howard Athenaeum, then under the management of her father, Edward L. Davenport. Her real debut was at Niblo's Garden in New York City in 1862, as King of Spain in *Faint Heart Never Won Fair Lady*. In 1869 she joined the company of Augustin Daly's Fifth Avenue Theatre. She married Edwin H. Price in 1879, but was divorced, and subsequently married Willet Melbourne MacDowell, leading man in her company. In 1897 she produced *A Soldier of France*, a play with Joan of Arc as the heroine. It failed, and the disappointment was said to have hastened her last illness. She made her last professional appearance at the Chicago Grand Opera House, March 25, 1898.

Consult Moses, Montrose J., *Famous Actor-Families in America* (New York 1906).

DAVENPORT, Harry, American actor: b. New York City, Jan. 19, 1866; d. Hollywood, Calif., Aug. 9, 1949. He began his stage career in 1871 at the age of 5 when he appeared as the son of Damon in *Damon and Pythias*, produced by his father, Edward L. Davenport. In 1876 he played Hendrick in *Rip Van Winkle*, with Joseph Jefferson; and in 1877 the Prince of Wales in *Richard III*, with John McCullough. He made his New York debut on May 5, 1879 at Wallack's Theatre as Sir Joseph Porter in John T. Ford's original juvenile company of *H. M. S. Pinafore*. Among his favorite roles was that of Rodney Harper in the original production of *Lightnin'* with Frank Bacon (1918). His last stage play was *Three Men on a Horse*, in which he played Mr. Carver (1935). Thereafter he devoted himself to motion pictures.

DAVENPORT, Henry Kallock, American naval officer: b. Savannah, Ga., Dec. 10, 1820; d. Franzensbad, Bohemia, Aug. 18, 1872. He entered the navy in 1838, and became connected with the coast survey in 1844. He was in the mail steamship service, 1849-1853; was subsequently on sea duty with various squadrons; and in 1856 took part in the capture of the Barrier forts, Canton River, China. During the Civil War he commanded the steamer *Hetsel*, 1861-1864, and in 1862-1864 was senior officer in command of the sounds of North Carolina. He was promoted captain in 1868 and assigned to command of the *Congress* in the European squadron (1870).

DAVENPORT, Herbert Joseph, American educator and economist: b. Wilmington, Vt., Aug. 10, 1861; d. New York, N. Y., June 17, 1931. A graduate of the University of South Dakota, he studied at Leipzig and Paris and the University of Chicago, where he taught political economy from 1902 to 1908. He then was appointed head of the department of political economy at the University of Missouri and subsequently dean of the School of Commerce there. In 1916 he became professor of economics at Cornell University, where he remained until 1930. At the time of his death he was on the faculty of the University of California at Los Angeles. Among his books are *Outlines of Economic Theory* (1896); *Value*

and *Distribution* (1908); and *Economics of Enterprise* (1913).

DAVENPORT, Homer Calvin, American cartoonist: b. Silverton, Oregon, March 8, 1867; d. (?) Morristown, N. J., May 2, 1912. He began newspaper work on the Portland *Oregonian*, and in 1892 joined the staff of the San Francisco *Examiner*. In 1895 he came to New York as cartoonist for the New York *Evening Journal*, where his work had great influence on public opinion. He originated the dollar-marked suit, first seen in his cartoons of Mark Hanna. His most famous cartoon was probably *He's Good Enough for Me*, drawn for the *Evening Mail* during Theodore Roosevelt's campaign for the presidency in 1904. He raised horses as an avocation and had a stable of Arabian thoroughbreds at his farm in Morristown, N. J.

He published *The Bell of Silverton* (1899), *Other Stories of Oregon* (1900), *The Dollar or the Man?* (1900), *My Quest of the Arab Horse* (1909), and *The Country Boy* (1910).

DAVENPORT, John, Puritan clergyman: b. Coventry, England, and baptized April 9, 1597; d. Boston, Mass., March 13, 1670. He was educated at Oxford, became chaplain of Hilton Castle near Durham, and later was vicar of St. Stephen's Church, London. His Puritanical views brought him into conflict with Archbishop William Laud, and in 1633 he went to Holland where he became co-pastor with the Rev. John Paget of the English church at Amsterdam. He soon got into trouble with the Dutch church authorities, however, and decided to go to America. He set out from England with his friend Theophilus Eaton (q.v.), arriving in Boston in June 1637; and in March 1638 he sailed with the band of colonists that founded New Haven (Quinnipiac), where he became extremely influential in civil as well as ecclesiastical affairs. He was minister there for 30 years and aided in establishing its theocratic system of civil polity, which began with the declaration that the colonists "would be ordered by the rules which the Scriptures held forth to them."

On June 4, 1649, at a constituent assembly held in a barn, the "free planters" resolved that church members only should be burgesses, elected annually, and Davenport was chosen one of the "seven pillars" to support the ordinance of civil government. With control of admission of members to the church, Davenport in reality also held the keys of political power. In 1660, when messengers of the king came to New Haven in pursuit of William Goffe and Edward Whalley, the regicide judges of Charles I, Davenport hid the fugitives in his house and preached to his congregation from Isaiah 16 (verses 3 and 4): "Hide the outcasts; betray not him that wandereth. Let mine outcasts dwell with thee, Moab; be thou a covert to them from the face of the spoiler."

After the death of John Wilson, pastor of the First Church in Boston, in 1667, Davenport moved there to succeed him. He was installed December 9, 1668. His election caused a division in the congregation. Those who disagreed with his opposition to the "half-way covenant" (which provided that those who were baptized in infancy and recognized their covenant obligations in maturity, might have their children baptized), withdrew and organized the Old South Church. The controversy went on for many years. Among his

publications are *Discourse About Civil Government in a New Plantation Whose Design is Religion* (1663); *The Knowledge of Christ Indispensably Required of All Men Who Would be Saved* (1653); *A Catechism, containing the Chief Heads of Christian Religion* (with Hooke 1659); *The Saints' Anchor-Hold* (1661); *The Power of Congregational Churches Asserted and Vindicated* (1672).

He was also an editor of the works of John Preston, for some time leader of the English Puritans.

Consult Mather, Cotton, *Magnalia Christi Americana* (1853); Dexter, Franklin B., *Sketch of the Life and Writings of Davenport* in *New Haven Colony Historical Society Papers*, vol. 2 (New Haven 1877).

DAVENPORT, Richard Graham, American naval officer: b. Washington, D.C., Jan. 11, 1849; d. Washington, D.C., May 30, 1926. In 1869 he was graduated at the United States Naval Academy, was commissioned ensign in the navy, July 12, 1870; promoted through the various grades, retiring, after more than 42 years' active service, June 30, 1907, as commodore. His various assignments included those of aid to the rear admiral representing the Navy Department at the Centennial Exposition, Philadelphia, in 1876, temporary duty at the Chicago Exposition of 1893, member of the Board of Civil Service Examiners for nautical experts, president of the permanent general court martial, also navigation and equipment officer and senior member of the board of inspection at the navy yard, Washington, member of the naval retiring board, assistant to the chief of the Bureau of Navigation, and at various times chief of divisions of the Hydrographic Office.

During the war with Spain he was second in command of the fleet blockading the coast of Cuba, and later was commander in chief of the Eastern Squadron. In 1898-1899 he made a biological survey of the waters around Puerto Rico and vicinity. He assisted in revising and editing many sailing directions and nautical books, published by the United States Hydrographic Office.

DAVENPORT, Robert, English poet and dramatist: flourished about 1623; d. 1639. He is known only through his *A Crowne for a Conqueror*; and *Too Late to Call Backe Yesterday. Two Poems, the One Divine, the Other Morall* (1623); *King John and Matilda* (1655), a tragedy; and two comedies: *A New Trick to Cheat the Devil* (1639), and *The City Night Cap* (printed 1661). That he was associated with Shakespeare in producing parts 1 and 2 of *Henry VI* seems established; and it is almost certain that he is the author of a play called *The Pirate*.

DAVENPORT, William Edwards, American social worker: b. North Stamford, Conn., Aug. 31, 1862. He was educated at the Brooklyn Polytechnic Institute 1875-1881; and was a special student at the Union Theological Seminary, 1897-1899. In 1901 he founded the Brooklyn Italian Settlement, which with other organizations was consolidated in 1910 as the United Neighborhood Guild. In 1902, 1904, and again in 1909 he was foreign correspondent for the *Brooklyn Eagle* and the *New York Evening Post*. He is well known as a lecturer on subjects relating to Italian immigration.

He has published *The New Dispensation* (1884); *Visions of the City* (1884); *The Perpetual Fire* (1886); *The Praise of Plymouth* (1892); *The Poet and His Friends* (1893); *Beecher—An Ode* (1891); *Poetical Sermons* (1896); *The Beggar Man of Brooklyn Heights* (1904); *Moral Effects of the Messina Earthquake* (1910); *Summons of the Slain* (1915); *Threnody of the Three Witnesses* (1917), and contributions to various periodicals.

DAVENPORT, William Henry Harrison: b. Feb. 1, 1841; d. Australia, July 1, 1877. He and his brother, IRA ERASTUS DAVENPORT (1839-1911), were American spiritualistic mediums, who professed to be adepts in spiritistic arts, and who by their skill in performing various feats and their clever deceptions, gained many followers. They flourished in 1860-1877, but were finally exposed as impostors by Houdini.

DAVENPORT, city, Iowa, Scott County seat; altitude 559 feet; on the Mississippi River opposite Rock Island, Illinois; 182 miles west of Chicago; on the Burlington; Chicago, Milwaukee, St. Paul and Pacific; and Chicago, Rock Island and Pacific railroads; served by the Federal Barge Line; has an airport. The river is crossed by a ferry, the U.S. free bridge, and two toll bridges—the Davenport-owned Iowa-Illinois Memorial (1935) and the Rock Island Centennial (1940) owned by Rock Island. Davenport, Rock Island and Moline form a "Tri-city" group. The Davenport metropolitan district (U.S. Census) includes much of Scott County, Iowa, and Rock Island County, Ill. Davenport is in a rich corn and hog area with limestone deposits. Trade is facilitated by rail connections and river barges. The river is open for an average of 298 days a year.

The main manufactured products are: iron and steel; steel wheels; pumps; washing machines; wood products, ready-cut houses and wooden soled shoes; food products; and pearl buttons. On the river front are Le Claire Park (named for one of the city's founders); the Municipal Stadium (4,000 seats); Municipal Natatorium; Lindsay Park; Credit Island, a battlefield of 1814. Larger parks are: Duck Creek, Vander Veer (annual chrysanthemum show); Fejervary, with a zoo, the gift of a Hungarian noble family. The city's tallest building is the 19-story, clock-towered Davenport Bank and Trust, with an historical mural of the Black Hawk Purchase Treaty. Another historical mural, depicting the first 100 years of Davenport's history, is separately housed. The Public Museum has good collections of mound builder remains, ancient foreign culture, and general science. The Municipal Art Gallery houses a general collection and holds an annual Tri-Cities Art Exhibit and a weekly art school for children. In the public library are 120,000 volumes and the valuable Ficke collection. The city has a Philharmonic Society; the State Federation of Music Clubs was organized here in 1916; and there are many German musical societies.

Chiropractic (q.v.) originated here in 1895, and the Palmer School is its principal training institution. The public schools have special courses in lip reading and speech correction. There are two Catholic colleges and academies and a famous Episcopal school for girls, St. Katherine's (1884). Davenport is a Catholic and

Episcopalian see city. It is governed by a mayor and aldermen.

The site of Davenport was at one time a trading post of the American Fur Company. The land was acquired by Antoine Le Claire, a French half-breed interpreter at Fort Armstrong, on Rock Island, to whom Black Hawk dictated his autobiography. Col. George Davenport and six other men bought the land from Le Claire, and in 1836 the town was laid out. It was incorporated in 1839 and chartered as a city in 1851. Growth was rapid following the opening to traffic of the first Mississippi River bridge (1856) and the establishment of the United States arsenal at Rock Island (1862). Pop. (1950) 74,549.

DAVENTRY, dāv'ēn-trī; also locally, dān'-trī, municipal borough, England, situated in Northamptonshire, 12 miles west of Northampton and 73 miles by rail northwest of London. A market town with shoe-manufacturing and engineering industries, it has considerable historical interest. Borough Hill, 1 mile east of Daventry, is the site of extensive ancient earthworks and Roman remains. The town was created a borough by King John. In 1576 it received a charter from Queen Elizabeth and a grammar school was established. In 1645, before the Battle of Naseby, it was the headquarters of Charles I. Since 1925 it has been a broadcasting center, and the British Broadcasting Corporation has a large overseas transmission station on Borough Hill. Pop. (1951) 4,078.

DAVID, dā'vid, or **DEWI**, dā'wī, **Saint**, patron saint of Wales; d. about 601. There is little authentic information about his life. As bishop of Menevia (now St. David's), he apparently established a strict rule and embarked on missionary enterprises, being credited with the foundation of monasteries at Raglan and at Glastonbury, Leominster, Repton, Crowland, and Bath. The last five places, however, are probably misreadings of Welsh names. Noted for his piety and reported to have had miraculous powers, St. David is said to have written several theological treatises and to have presided at two synods. He was canonized by Pope Callistus II in 1120, and in the Middle Ages his shrine became an important place of pilgrimage. His feast day, March 1, is a Welsh national festival.

Consult Wade-Evans, A. W., *Life of St. David* (London 1923).

DAVID, king of Judah and Israel: d. about 962 B.C. Biblical sources in the books of Samuel present on the whole a strictly historical picture of David, probably because they drew heavily on a court diary written by an observer who was devoted yet impartial, perhaps the priest Abiathar himself. According to the late testimony of I Chronicles 2:15, David was the youngest of the seven sons of Jesse of Bethlehem. As stated in the earlier document of I Samuel 16:10 (compare I Samuel 17:12), he was the youngest of Jesse's eight sons. The story of his anointing by Samuel describes him as a handsome lad with a ruddy complexion and beautiful eyes (I Samuel 16:12). Not less rugged than his older brothers, he kept his father's sheep, a task which in the wilderness of Judah, near Bethlehem, required unusual physical stamina, skill, and courage. His fame as a singer and player attracted the attention of the court, and King Saul (r. 1020-1002 B.C.) sum-

moned him to his palace to soothe the royal melancholy with music and poetry. According to another tradition, which reflects the typically folkloric transfer of a story from an unknown warrior to a popular hero (compare I Samuel 17:1 ff. with II Samuel 21:19), David came to the notice of Saul by his feat of slaying the Philistine giant Goliath. At any rate, the young Judahite became the king's troubadour and squire. His prowess in the constant struggle with the Philistines gained him growing popular favor, and the women used to sing (I Samuel 21:11):

Saul has slain his thousands,
And David his ten thousands.

While the king became increasingly envious of him, David became the bosom friend of the royal prince Jonathan and even obtained the royal princess Michal as a wife (I Samuel 18:27). Threatened with death by Saul, he fled first to the priests of Nob, and then headed a band of southern guerrilla fighters who secured Keilah when it was endangered by the Philistines, but could not make a stand against the royal army. Varied adventures followed, in one of which David spared the king's life (I Samuel 24:7). Finally he sought refuge among the Philistines and became a vassal of Achish of Gath, from whom he received Ziklag as a residence.

After Saul and his three sons fell at Mount Gilboa, the people of Ephraim submitted to Philistine rule, and Abner, Saul's general, succeeded in preserving only a small kingdom east of the Jordan in Mahanaim for Saul's surviving son, Ish-bosheth (Esh-baal). David then saw his opportunity. He negotiated with southern clans and was anointed tribal king of Judah at Hebron (c.1002 B.C.). There he ruled for seven and one-half years while preserving a tense relationship with the Philistines in the southwest. Abner attempted to reconquer Israel for Saul's son, but ultimately transferred his allegiance to David. Surrendering to David's nephew and chieftain, Joab, he was put to death. Meanwhile, Ish-bosheth was killed by two of his own henchmen. The elders of Israel then offered David the throne of Israel.

The new king's first step was to rally the northern tribes and to free the whole country from the yoke of the Philistines—a feat which was accomplished after a long series of battles. From the Jebusites, the last autonomous survivors of the native Canaanites, David seized the strategically located fortress of Jerusalem, which he made his capital in an effort to cement the unity of north and south. In order to put a Yahwistic stamp on pagan Jerusalem, he transferred to the new capital the ancient Ark of the Covenant, which had been at one time the rallying point of the Hebrew tribes. His attempt to erect a sanctuary did not succeed, however, since it probably conflicted with the nomadic memory of the traditionalists, who found in the prophet Nathan an eloquent spokesman (II Samuel 7:1-17). While details of David's political and military activity as a ruler are scanty, it appears that he conquered the Edomites in the south, the Moabites and Ammonites in the east, and the Aramaeans in the north, thus making Israel the most powerful country between the Nile and the Euphrates (II Samuel 8:2-14; 10:1-5). The possession of the Promised Land was complete, the unity of the people was realized, and for the first time the dream of the ancient Hebrew nomads had come true.

Despite these successes, David's reign was darkened by domestic difficulties and political vicissitudes. He had Uriah, one of his trusted warriors, treacherously exposed in combat in order to secure the latter's wife, the beautiful Bathsheba, for himself. He accepted Nathan's condemnation of this action, however, and recognized the criminality of his behavior. Amnon, his eldest son and heir presumptive, was put to death by another son, Absalom. Then Absalom revolted against his father, and was killed by Joab against David's express command. Bitter factions arose, and the revolt might have proved serious if it had not been promptly quelled by Joab. The question of succession to the throne disturbed the king's last days. Adonijah, his eldest surviving son, had been permitted by David to appear officially as his heir and had a party of his followers anoint him king. Bathsheba, however, succeeded in securing the throne for her son, Solomon. Soon thereafter David died, having reigned at Jerusalem for 33 years (I Kings 2:11).

The picture of David's personality presented in I Chronicles (written in the 3d century B.C.) is quite different from that of the Samuel sources. It omits features which might be regarded as doubtful or offensive and stresses especially the king's activity in organizing the cultic ceremonial, gathering material for worship, and arranging for priests, attendants, singers, and other subordinate officials. In addition, it includes ordinances referring to military and administrative matters.

There is no doubt that David was a sacred musician and poet. His literary skill and elegiac power are revealed in his dirge over the deaths of Saul and Jonathan (II Samuel 1:19-27). It is likely that he composed what is now the core of several of the Psalms (compare, for example, II Samuel 22 with the 18th Psalm), but it is highly improbable that the many Psalms ascribed to him are earlier than the 8th, 7th, or 6th centuries B.C.

David has come down to us as at once a towering and a baffling personality: brave, loyal to his benefactors, yet capable of cruelty, weak toward his sons, faithful to the religion of his fathers, and humble before Yahweh's prophet—in brief, a superior man whose intellectual and religious greatness balanced moral irresponsibility. His figure has haunted Jewish, Christian, and Moslem legend, and has found its place in sculptured stone and stained glass in the medieval cathedrals.

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BIOGRAPHICAL FICTION: Cooper, A. D., *David* (New York 1943); Schmitt, Gladys, *David the King* (New York 1946); Bargellini, Piero, *David*, tr. by Elisabeth Abbott (New York 1954).

SAMUEL TERRIEN,
Union Theological Seminary.

DAVID I, king of Scotland: b. 1084; d. Carlisle, England, May 24, 1153. The youngest son of Malcolm III and St. Margaret, he became earl or prince of Cumbria in 1107 by the will of his brother King Edgar. This section of Scotland, lying south of the Clyde and the Forth, he organized on feudal lines. By his marriage in 1113

with Matilda, widow of Simon de St. Liz, earl of Northampton, he became an English baron. In 1124 he succeeded his brother Alexander I on the throne of Scotland. In the struggle for the English crown between his niece, Empress Matilda, and Stephen, following the death (1135) of Henry I, he favored Matilda. He invaded Northumberland, but was driven back by Stephen and forced to make peace. The peace was not kept, and in 1138, David was decisively defeated in the Battle of the Standard, near Northallerton (see STANDARD, BATTLE OF THE). He then concluded an advantageous peace at Carlisle, but joined Matilda at London in 1140 and fled with her to Winchester. In the following year he escaped to Scotland. He once more unsuccessfully invaded England, in 1149, but thereafter turned to the development of his own kingdom. Among David's reforms were the introduction of the Norman feudal system, the organization of a feudal court, and the establishment of the office of chancellor for the administration of the laws and the publishing of royal charters. Much of his legislation was designed to further commerce and industry. He founded many monasteries, the bishoprics of Brechin, Dunblane, Caithness, Ross, and Aberdeen; and the burghs of Edinburgh, Berwick, Roxburgh, Stirling, and perhaps Perth. He was succeeded by his grandson, Malcolm IV.

RICHARD WEBB

DAVID II, king of Scotland: b. Dunfermline, Scotland, March 5, 1324; d. Edinburgh, Feb. 22, 1371. The only son of King Robert I (Robert VIII, the Bruce), he succeeded his father on the throne on June 9, 1329. With his queen, Joan, sister of Edward III of England, to whom he was married in 1328, he was crowned at Scone in 1331. The claim of the young monarch to the crown was disputed by Edward de Baliol, who was secretly supported by Edward III. In 1333, David's supporters, led by Sir Archibald Douglas, were defeated by Baliol and King Edward at Halidon Hill, and David and Joan retired first to Dumbarton and then, in 1334, to France. David remained in exile until 1341, when he returned to Scotland to take the administration of the country into his own hands. In 1346 he invaded England at the request of Philip VI of France, but on October 17 of that year was taken prisoner at Neville's Cross, near Durham. He was a captive until 1357, when he was freed by the Treaty of Berwick on the severe terms of paying a ransom of 100,000 marks in 10 years. On his return to Scotland, David found the kingdom so poor that it was impossible to pay more than a few installments, and he offered to make Edward III's son Lionel, 1st duke of Clarence, his heir. Although this proposal was rejected by the Scottish Parliament in 1363, he continued to negotiate with Edward to make the English king or one of his sons heir to the throne. Dying childless David was succeeded by his nephew, Robert II, the first Stuart monarch.

RICHARD WEBB.

DAVID (Welsh DAFYDD or DAVYDD AL GWILYM), Welsh poet: b. about 1325; d. about 1385.¹ He seems to have received a good education and to have had considerable knowledge of Italian and Latin. His fondness for satire was unpleasant to his neighbors, and he was at one

¹ Some sources give his dates as 1340-1400.

time forced to leave home on this account. To Morfudd (Morvydd) of Anglesey, the lady whom he loved, he addressed 147 poems. Although she returned his love, she was forced into an uncongenial marriage with an elderly man. David eloped with her, and the fine imposed on him by her husband was so heavy that he could not have paid it but for the assistance of the men of Glamorganshire. He is undoubtedly the greatest of the medieval Welsh poets, and has been compared to Horace and Petrarch. He composed love odes; nature poems, such as *The Lark*, *The Hmd*, and *The Mist*; and satires. Most of his poems were written in the meter called *cywydd*, of seven-syllable lines rhyming in couplets. A total of 262 of his poems were collected and published by Owen Jones and William Owen-Pughe in 1789. Others have been discovered in manuscript in the Mostyn Library and the British Museum. In 1942, H. I. Bell and David Bell published a translation of 50 of David's poems, with introductory essays. See also CELTIC LITERATURES—*Welsh Literature*.

DAVID, SIR (Tannatt William) Edgeworth, Australian geologist: b. St. Fagans, near Cardiff, Wales, Jan. 28, 1858; d. Sydney, Australia, Aug. 28, 1934. He was educated at New College, Oxford, from which he received his B.A. degree in 1880. After studying geology at the Normal School of Science and Technology (later Royal School of Mines), he served as assistant geological surveyor of New South Wales (1882–1890), where he discovered important coal resources. From 1891 to 1924 he was professor of geology at the University of Sydney. In 1897 he led a Royal Society expedition to the Ellice Islands to study the origin of atolls. As a scientific officer with Ernest Henry Shackleton's Antarctic expedition (1907–1909), he was a member of the first party to climb Mount Erebus (March 10, 1908) and, with Douglas Mawson, led the party that reached the South Magnetic Pole (Jan. 16, 1909). During World War I he served as an officer in a mining battalion and as a geological adviser to the British armies on the western front. He was knighted in 1920. In addition to many scientific papers, he published *A New Geological Map of the Commonwealth of Australia* (including a volume of explanatory notes, 1932); and compiled *Geology of the Commonwealth of Australia*, which, after his death, was edited and supplemented by W. R. Browne (3 vols., 1950).

DAVID, dā-vēd', Félicien (César), French composer: b. Cadenet, Vaucluse, France, April 13, 1810; d. St.-Germain-en-Laye, Aug. 29, 1876. He was brought up in Aix, where he sang in the cathedral, studied at the Jesuit college, and conducted an orchestra. In 1830 he went to Paris to study at the Conservatoire National de Musique, and in the following year became an ardent advocate of the doctrines of Claude Henri de Saint-Simon. From 1833 to 1835 he traveled in the Middle East. Returning to France, he published his *Mémoires Orientales*, but attracted little critical attention until 1844, when his most successful work, the symphonic ode *Le Désert*, appeared. Among his other works, which are characterized by their picturesque use of Oriental themes, are the operas *L'Eden* (1848), *La Perle du Brésil* (1851), *Herculanum* (1859), *Lalla-Roukh* (1862), and *Le Saphir* (1865); the oratorio *Moïse au Sinai* (1846); the symphonic ode

Christophe Colomb (1847); two symphonies; and chamber music.

DAVID or DAVIT, da'vit, Gerard or Gheerardt or Gheeraert, Dutch painter: b. Oude-water, Netherlands, 1450? or 1460?; d. Bruges, Aug. 13, 1523. He studied with Dutch masters, perhaps with Albert van Ouwater at Haarlem, and in 1483 settled in Bruges, where, in the following year, he was admitted to the Guild of St. Luke. He became dean of the guild in 1501 and executed a number of commissions for the city. David was a leading painter of the Flemish school, noted for his use of color. Among his works, which show the influence of Jan van Eyck, Rogier van der Weyden, and Hans Memling, are *The Rest on the Flight to Egypt*, in the National Gallery, Washington; *Virgin and Child*, in the Philadelphia Museum of Art; *The Crucifixion and Christ Taking Leave of His Mother*, in the Metropolitan Museum of Art, New York; *Pietà* and *The Marriage of St. Catherine*, in the National Gallery, London; *Baptism of Christ and Judgment of Cambyses*, in the Musée des Beaux-Arts, Bruges; *Madonna with Angels and Saints*, in the Musée des Beaux-Arts, Rouen; and *The Marriage at Cana*, in the Louvre, Paris.

DAVID, da-vēd', Jacques Louis, French painter: b. Paris, France, Aug. 30, 1748; d. Brussels, Dec. 29, 1825. A pupil of Joseph Marie Vien, he won the Prix de Rome in 1775 with his *Antiochus and Stratonice*. His leanings toward classicism were strengthened during his stay in Rome, and he is considered the founder of the French classical school. Returning to Paris in 1780, he became a member of the Académie Royale de Peinture et de Sculpture three years later. In 1784 he painted on commission from Louis XVI his celebrated *Oath of the Horatii*, now in the Louvre; in 1787, his *Death of Socrates* (Metropolitan Museum of Art, New York); in 1788, *The Loves of Paris and Helen* (Louvre); and in 1789, *The Return of Brutus* (Louvre). After the outbreak of the French Revolution he became an ardent Jacobin. He organized a number of republican celebrations, and in 1792 was elected a deputy to the National Convention. He voted for the death of the king and was a close friend of Maximilien de Robespierre. After the latter's fall, in 1794, he was imprisoned for a few months. Meanwhile, he executed his *Marat Assassinated* (1793, Brussels Museum) and a self-portrait (1794, Louvre). From the following year date his portraits of M. and Mme. Sériziat (Louvre). Also in the Louvre is *The Rape of the Sabine Women* (1799). In 1804 he was appointed court painter to Napoleon and commissioned to execute four large pictures, of which two were completed: *Consecration of Napoleon* (also known as *Coronation*, 1805–1807, Louvre) and *The Distribution of the Eagles* (1810, Versailles). *Leonidas at Thermopylae* (1814, Louvre) is the last painting he completed in Paris. Banished as a regicide after the second restoration of Louis XVIII, he lived in exile in Brussels from 1816 until his death. There he executed *Les Trois Dames de Gand* (Louvre); *Mars Disarmed by Venus* (Brussels Museum); and a number of portraits. David's classical and historical works, with their cold, formal composition, lack the charm of some of his portraits, such as those of Madame Récamier and Pope Pius VII, both in the Louvre.

Consult Rosenthal, Léon, *Louis David* (Paris 1904); Cantinelli, Richard, *Jacques-Louis David* (Paris 1930); Rosenau, Helen, *The Painter Jacques-Louis David* (London 1948).

DAVID, Laurent Olivier, Canadian author: b. Sault-au-Récollet, Quebec, Canada, March 24, 1840; d. Montreal, Aug. 24, 1926. Educated at the Collège de Ste. Thérèse, he was called to the bar in 1864, but soon turned to journalism. He founded and edited *L'Opinion Publique* (1870) and *Le Bien Public* (1874), and from 1886 to 1890 served in the Quebec Legislative Assembly. In 1892 he became city clerk of Montreal, and in 1903 was appointed to the Canadian Senate. Meanwhile, he published a number of historical and biographical works, of which the most important are *Le héros de Châteauguay* (1883); *Les patriotes de 1837-38* (1884); *Les deux Papi-neau* (1896); *L'union des deux Canadas, 1841-67* (1898); *Laurier et son temps* (1905); *Histoire du Canada depuis la Confédération* (1909); and *Laurier, sa vie, ses oeuvres* (1919).

DAVID, Pierre Jean (known as DAVID D'ANGERS), French sculptor: b. Angers, France, March 12, 1788; d. Paris, Jan. 5, 1856. He studied in Paris in the atelier of Philippe Laurent Roland, and in 1811, with his bas-relief *Death of Epaminondas*, won the Prix de Rome. During his five years in Rome he came under the influence of Antonio Canova. On his return to Paris in 1816 he opened his own studio and soon became famous with his colossal statue of the Great Condé, now at Versailles. In 1826 he became a member of the Académie des Beaux-Arts and professor at the École des Beaux-Arts. His masterpiece is the sculptured pediment of the Panthéon in Paris, which he completed in 1837. He took part in the revolution of 1848 and was a member of the Constituent Assembly. In 1851, following the coup d'état of Napoleon III, he went into exile and spent some time in Greece. David executed a large number of statues, busts, and medallions.

A complete collection of David's works, either of originals or of copies, is in a special museum at Angers. Among his statues are those of Thomas Jefferson, François Fénelon, Jean Bart, and François Joseph Talma. His busts include portrayals of George Washington, the marquis de Lafayette, Victor Hugo, Johann Wolfgang von Goethe, Stendhal, René de Chateaubriand, Alphonse de Lamartine, and Nicolò Paganini. His medallions, which number over 500, depict most of the famous persons of his time including Bonaparte, Rossini, and George Sand.

DAVID, dä-vêth', city, Panama, capital of Chiriqui Province, situated on the David River 5 miles north of the Pacific port of Pedregal, and on the Inter-American Highway 310 miles southwest of Panama City. The third largest city of the republic, it is the trading and processing center of a fertile district raising cattle, corn, sugarcane, coffee, cacao, coconuts, rice, fruit, and vegetables, and has tanneries and establishments producing furniture, soap, ceramics, beverages, and shoes. Founded in 1738, David is attractively laid out and has two colonial churches. Pop. (1950) 14,847.

DAVID BALFOUR (entitled CATRIONA in Great Britain), a novel by Robert Louis Stevenson (q.v.), which was published in 1893.

A sequel to *Kidnapped*, this novel opens with the attempt of David Balfour to effect the escape of his friend, Alan Stewart, from Scotland; and to aid Stewart's brother, unjustly imprisoned on a charge of murder. He falls in love with Catriona Drummond, is imprisoned, and after his release goes to Holland, where he lives with Catriona without marriage. Her father interfering, the two are separated; but by the intervention of Alan Stewart they meet again and are married. The novel is in the romantic vein, written with Stevenson's simplicity and clearness, and is artistic in construction. See also KIDNAPPED.

DAVID CITY, city, Nebraska, and seat of Butler County, altitude 1,619 feet, on the Union Pacific, the Burlington, and the Chicago and North Western railroads and on state and federal highways, 74 miles west of Omaha; has grain elevators and flour mills; and makes concrete products and brick, ice cream and butter, and garden tools. It has a mayor-council government; municipal waterworks; a Carnegie library and a hospital. Pop. (1940) 2,272; (1950) 2,321.

DAVID COPPERFIELD, a novel by Charles Dickens which appeared in 20 monthly numbers, beginning in May 1849 and ending in November 1850. Dickens liked it the best of all his books. His fondness for this child of his fancy, as he called it, was partly due to the fact that the novel was reminiscent of his own early life. Not autobiography exactly, the novel rather runs on correspondencies between the careers of Charles Dickens and David Copperfield. D. C. is C. D. reversed. *David Copperfield* is the story of a young man, who by his industry and talents rises out of the lower middle class—the proletariat almost—into literary fame. He passes through a cruel and degraded childhood, being compelled at one time to earn his living by pasting labels on bottles in a wine shop with urchins like Mick Walker and Mealy Potatoes, and in the occupation he nearly starves to death. He is befriended by his great-aunt, Betsy Trotwood, who sends him to school, where he displays unusual abilities; he studies law, learns stenography and becomes an expert reporter in the House of Commons; he writes books and thereby gains a name. Throughout his career he associates with all sorts and conditions of men, from gentlemen down to rascals, some of whom, like Uriah Heep, find their way into jails. He marries twice; the child wife Dora dies, and he becomes supremely happy in the union with the mature Agnes. Everywhere *David Copperfield* is a skilful mixture of fact and fiction. Dickens drew upon himself and a score of others for personal traits out of which his imagination created characters, rare and new.

Quite apart from autobiography, many readers have regarded *David Copperfield* as Dickens's best novel. "Dickens never stood," says his biographer, "so high in reputation as at the completion of *Copperfield*. The popularity it obtained at the outset increased to a degree not approached by any previous book except *Pickwick*." The novel was admired by Bulwer-Lytton and Thackeray, and praised by Matthew Arnold, who rarely condescended to notice fiction. "What treasures of gaiety, invention, life, are in that book! What alertness and re-

sources! What a soul of good-nature and kindness governing the whole!" These were Arnold's words. In my opinion, *David Copperfield* contains no character quite equal to Mr. Pickwick, Sam Weller or Dick Swiveller, nor does it display the grotesque fancy of *Great Expectations*, or the wonderful intellectual grasp of *Bleak House*. To know Dickens it is necessary to read all that he ever wrote. But as a work of art *David Copperfield* is Dickens' masterpiece. It contains little or no melodrama, little or no exaggerated pathos; farce and caricature are held in restraint to the point where they become comedy; incident naturally rises out of character, and character naturally rises out of incident. The most remarkable creation, said to be a remote likeness of Dickens' own father, is Mr. Micawber, the happy impecunious gentleman, whose debts do not trouble him so long as he can keep out of jail; who always eats, drinks, orates and sleeps in perfect contentment, certain that something will turn up. He is not dazed by the prospect of emigrating to Australia, where something does actually turn up, and he finds ample scope for his rhetoric in a colonial newspaper.

It is a decided drop from Micawber to Copperfield. The story of his boyhood is excellent, but Copperfield really develops into a cad without the author's knowing it. Nor are Dora and Agnes girls who now greatly interest readers. But there is the eccentric Betsy Trotwood who treats Mr. Dick the lunatic as if he were sane and protects David against Mr. Murdstone. She is admirably conceived and developed. And there are Peggotty, nurse and servant, with cheeks and arms so red that the birds might peck them in preference to apples, and her brother the fisherman and Barkis who "was willin'," and finally won her. In depicting the Peggotty group of characters Dickens rendered the mingled humor and pathos and heroism of humble life in a surprising manner. Streaks of pain and crime run through the book, but scoundrels like Steerforth and Uriah Heep are somehow forgotten for the fun. *David Copperfield*, it has been observed, "is the perfection of English mirth."

DAVID D'ANGERS. See DAVID, PIERRE JEAN.

DAVIDISTS, the name given to two distinct religious sects, namely, the followers of David of Dinant in the 13th century, and those of David George or Joris in the 16th. David of Dinant was a teacher in the University of Paris and contemporary of Amalric of Bena (Amaury de Bène). At the death of Amaury (1204) he continued to teach Amaury's pantheistic doctrine, founded on Neoplatonism, that the "All is God." David taught that holiness is simply the consciousness of the presence of God, the thought that God is the "One and the All": that he who attains the perfect view of the God-All cannot sin, no matter what enormities he commits; he is the Christ, he is the Holy Ghost. The other sect of Davidists, called also David-Georgians, after the name of their founder, who was born at Delft in 1501, had its rise in 1534. Its founder published in 1542 his *Book of Wonders*, recounting his marvelous visions and divine revelations. But he retired from the leadership in 1544, and during the remainder of his life was a prosperous merchant at Basel, under an assumed name. By order of the senate of Basel, his body, as that of a heretic, was exhumed and burnt. The sect, with Henry Nicolas as its head, made progress in Holland and got a footing in England, being now known as Familists. The Familists taught as their chief tenet the gospel of love, divine love. Love, they held, is above all laws, whether ceremonial, moral or civil, and the practice of the sectaries was so consonant with this doctrine that early in the 17th century the societies of Familists had to be suppressed in both countries, by the civil power.

DAVIDS, Thomas William Rhys, English Oriental scholar: b. Colchester, May 12, 1843; d. Dec. 26, 1922. Educated at the University of Breslau; after 1866 filled judicial places in Ceylon and acted as archaeological commissioner. In 1877 he was called to the English bar; was professor of Pali and Buddhist literature in University College, London (1882-1912); and professor of comparative religion, Manchester (1912-15). Among his works are *Buddhism* (1878); *Buddhist Suttas and Vinaya Texts* (1891); *American Lectures* (1896); *Sacred Books of the Buddhists*; *Dialogues of the Buddha* (1899); *Buddhist India* (1902); *Early Buddhism* (1908). In translating from Pali texts he was assisted by Caroline Augusta Foley, an authority on Buddhism whom he married in 1894.

DAVID'S DEER (*Cervus davidianus*), a deer found in northern China and in Manchuria. It derives its name from Père David, a French Catholic missionary, who first saw it in the imperial park at Peking. It resembles the Indian swamp-deer, but has long, shaggy hair and a long tail. It has no brow-tine. Little is known of its wild habits, for all of the representatives are found in parks in Europe, and it is likely soon to become extinct.

DAVIDS ISLAND, an island in Long Island Sound, near New Rochelle, N. Y., owned by the United States government and used for military purposes, especially as a training station for infantry recruits. It has an area of about 100 acres, and is fortified as Fort Slocum.

DAVIDSON, Andrew Bruce, Scottish biblical scholar: b. Aberdeenshire 1831; d. 1902.

He took his master of arts degree at Aberdeen in 1849, and in 1856 graduated from the divinity school of New College, Edinburgh, where in 1863 he became full professor of Oriental languages. His books, including the incomplete *Commentary on Job* (1862) and *The Old Testament Prophecy* (1903), were noted for their scientific criticism and direct psychological analysis. He belonged to the Old Testament Company of Revisers. Language studies, which took him as far as Syria, resulted in his *Outlines of Hebrew Accentuation, Prose and Poetical* (1861), and his *Introductory Hebrew Grammar* (1874).

DAVIDSON, Donald (Grady), American author: b. Campbellville, Tenn., Aug. 18, 1893. After graduating from Vanderbilt University in 1917, he began teaching English there in 1920 and in 1931 joined the faculty of the Bread Loaf School of English in Vermont. He was a founder of the poetry journal, *The Fugitive* (1922-1925). His verse, characterized by a regional spirit, includes *An Outland Piper* (1924); *The Tall Men* (1927); and *Lec in the Mountains* (1938). Other books are *The Attack on Leviathan* (1938); *American Composition and Rhetoric* (1939); and *The Tennessee*, 2 vols. (1946, 1948).

DAVIDSON, George, American astronomer and geographer: b. Nottingham, England, May 9, 1825; d. Dec. 2, 1911. His family settled in Philadelphia, Pa., where he was educated. In 1845 he joined the United States Coast Survey; his work, mainly in the West, included research for his *Directory for the Pacific Coast of the United States* (1858) and his *Coast Pilot of Alaska* (1869). From the measurements he made of the great base lines called the Davidson quadrilaterals, the primary triangulation of the Pacific states was derived. He observed two total solar eclipses and a transit of Mercury and directed observations of the transit of Venus in Japan (1874) and New Mexico (1882). He also visited China, India, Egypt, and Europe to study land reclamation.

Although he had a part in persuading James Lick to endow an observatory, Davidson reportedly was not satisfied with the location selected. His own observatory, established in San Francisco in 1879, was the first in California. From 1877 to 1884 he was a regent of the University of California, and in 1895 became honorary professor of geodesy and astronomy there. Among his works are *California* (1887); *The Discovery of San Francisco Bay* (1907); *Francis Drake on the Northwest Coast of America* (1908); and *The Origin and the Meaning of the Name California* (1910).

DAVIDSON, Israel (real surname MOVSHOVITZ, möv-shö'vits), American Semitic scholar: b. Yanova, Russia, May 27, 1870; d. Great Neck, N. Y., June 27, 1939. In 1888 he came to the United States. Awarded the B.A. degree by the College of the City of New York in 1895, he received from Columbia University his Ph.D. in 1902. From 1915 to 1939 he was professor of medieval Hebrew literature at the Jewish Theological Seminary of America. He wrote *Parody in Jewish Literature* (1907), and was the compiler of a reference work in Hebrew, *Thesaurus of Medieval Hebrew Poetry*, 4 vols. (1924-1933). In 1940 his *Rhymes in Hebrew Poetry* was published in Hebrew, with an introduction in English.

DAVIDSON, James Wheeler, American consular agent and business leader: b. Austin, Minn., June 14, 1872; d. Calgary, Alberta, Canada, July 18, 1933. After graduating from the Northwestern Military Academy, Highland Park, Ill., he became a member of Robert E. Peary's expedition to northern Greenland in 1893-1894. He then served as a war correspondent in the Sino-Japanese War, with the Chinese Army in 1895 and with the Japanese forces during that year and the next. In 1898 he became United States consul for Formosa and the Ryukyu Islands, remaining there until 1904, then held several consular posts in China. Later he became a leader in the lumber industry in the United States and an organizer for the Rotary International in the Near and Far East. His books include *A Review of the History of Formosa* (1896); and *The Island of Formosa, Past and Present* (1903).

DAVIDSON, James Wood, American author: b. Newberry County, S. C., March 9, 1829; d. about June 15, 1905. He graduated from the South Carolina College (now the state university) in 1852, and until the Civil War taught Greek in South Carolina schools. During the war he served as adjutant of the 13th Regiment of South Carolina Volunteers which fought in Virginia under Stonewall Jackson. Later he returned to teaching, then worked on newspapers in Washington and New York. In 1884 he moved to Florida and became a member of the state legislature and the constitutional convention. After 1887 he held a clerkship in the Treasury Department in Washington. He wrote *A School History of South Carolina* (1869); a collection of specimen pieces, *Living Writers of the South* (1869); *The Poetry of the Future* (1828); and *Florida of Today* (1889).

DAVIDSON, Jo (real given name, JOSEPH), American sculptor: b. New York, N. Y., March 30, 1883; d. Tours, France, Jan. 2, 1952. When about 19 years of age he gave up his premedical studies at Yale University to study sculpture, first in New York and then in Paris. After 1907 he lived mostly in France, but traveled widely. By 1914 he had sculptured many prominent persons in impressionistic style. After the 1918 armistice he made busts of the Allied military and government leaders, and exhibited them in New York City. *Woodrow Wilson* and *Anatole France* (both in the Luxembourg Museum, Paris), *Walt Whitman* (Bear Mountain State Park, N. Y.), and *Robert M. La Follette* (Capitol Rotunda, Washington, D.C.) are among his major works. His autobiography, *Between Sitings*, published in 1951, reveals his interest in politics as well as the arts.

DAVIDSON, John, Scottish author: b. Barrhead, Renfrewshire, Scotland, April 11, 1857; d. by drowning, March (c.23), 1909. After studying at Edinburgh University and teaching intermittently in Scottish schools until 1890, he went to London, determined to devote himself to literature. *Fleet Street Eclogues* (1893) and *Ballads and Songs* (1894) gained him a reputation as a lyric poet. His plays, including *Bruce* (1886), *Smith, A Tragedy* (1888), and *Scaramouch in Naxos* (1889) are marked by poetic fantasy. Among his other works are *New Ballads* (1896); *The Last Ballad and Other*

Poems (1899), *The Testament of a Man Forbid* (1901); *The Testament of an Empire Builder* (1902), and the novels *Perfervid* (1890) and *Baptist Lake* (1894). In a fit of depression he committed suicide by drowning near Penzance.

DAVIDSON, Thomas, Scottish-American philosopher and educator: b. Deer, Aberdeenshire, Scotland, Oct. 25, 1840; d. New York, N. Y., Sept. 14, 1900. After graduation with honors from the University of Aberdeen in 1860, he taught in various British schools until 1866, when he migrated to Canada and thence, in 1867, to the United States, where he taught in a high school in St. Louis, Mo., until 1875. Thereafter Davidson lived in Cambridge, Mass., but spent most of the period 1878–1884 in Italy. In 1883 he founded the Fellowship of the New Life, whence the Fabian Society (q.v.) was an offshoot. An accomplished linguist, of prodigious memory and enormous erudition, exact in scholarship, Davidson wrote many works, of which may be mentioned: *The Place of Art in Education* (1886), *Aristotle and Ancient Educational Ideals* (1892), *The Education of the Greek People and Its Influence on Civilization* (1894), *A History of Education* (1900), *The Education of the Wage-Earner* (1905).

DAVIDSON, William Lee, American soldier: b. Lancaster County, Pa., 1746; d. Cowan's Ford, N. C., Feb. 1, 1781. He was one of the leading patriots in the Carolina Piedmont during the early days of the American Revolution. In 1776 he was commissioned major of the 4th North Carolina Regiment and marched north to join Washington's army. He fought at Germantown, where he was promoted lieutenant colonel for gallantry, suffered through Valley Forge, returned to Carolina in 1779, when the depleted forces from his state were consolidated and extra officers were released, and joined the militia. His popularity was such that the legislature appointed him brigadier general of the Salisbury District militia, despite the prejudice against giving militia commands to Continental officers. The Battle of Kings Mountain was won by forces technically under his command and following his orders, although he himself was not present. Mecklenburg County earned its sobriquet "Hornet's Nest" from the British while he commanded the militia. When Gen. Nathanael Greene assumed command of the Southern forces, he placed chief reliance on General Davidson for raising militia. While attempting to prevent Lord Cornwallis from crossing the Catawba River, Davidson lost his life at Cowan's Ford. His name is perpetuated by Davidson College (q.v.) and by counties in North Carolina and Tennessee. A monument to him was erected on the site of the Battle of Guilford Courthouse.

DAVIDSON COLLEGE, a liberal arts institution for men at Davidson, N. C. It was named in honor of Gen. William Lee Davidson (q.v.) and founded under the auspices of the local Presbyterians. Its original charter proclaimed its purpose to be "to educate youth of all classes without any regard to the distinction of religious denominations." Instruction began in March 1837. It is controlled by trustees, of whom most are selected by Presbyterian assemblies in North Carolina and Florida and some are chosen by the college's alumni association. Em-

phasis is placed on the liberal arts and no degrees beyond the bachelor's are awarded for work in course. The student body is limited normally to about 650 men. The normal faculty is about 55. The first X-ray radiograph in the United States was made at Davidson College on Jan. 12, 1896. Two national honorary fraternities, Sigma Pi Sigma (physics) and Gamma Sigma Epsilon (chemistry), were founded here. The library contains some 50,000 volumes, with special collections relating to Woodrow Wilson (an alumnus), Peter S. Ney (a mysterious character who designed the college seal in 1840), and local history.

DAVIDSON OF LAMBETH, BARON (RANDALL THOMAS DAVIDSON), English prelate: b. Edinburgh, Scotland, April 7, 1848; d. Chelsea, England, May 25, 1930. Educated at Trinity College, Oxford, 1867–1871, after travel, study, ordination, and a curacy in Kent, he became resident chaplain to the archbishop of Canterbury in 1877. As a confidant of Queen Victoria, Davidson's rise in the Anglican Church was rapid: dean of Windsor, 1883–1891; bishop of Rochester, 1891–1895; bishop of Winchester, 1895–1903; archbishop of Canterbury, 1903–1928. On resignation of the last see he was created a baron. During his last years of service Davidson was much concerned with revision of the Book of Common Prayer, but bravely bore its defeat by Parliament in 1927 and 1928. Among his writings are *The Christian Opportunity* (1904), *Captains and Comrades in the Faith* (1911), *The Testing of a Nation* (1919).

Consult Bell, George K. A., *Randall Davidson, Archbishop of Canterbury*, 2 vols. (Oxford 1935).

DAVIE, dā'vī, William Richardson, American soldier: b. Cumberland, England, June 21, 1756; d. Camden, S. C., Nov. 29, 1820. He was brought to North Carolina when a child and was graduated at Princeton, N. J., in 1776. He entered the Continental Army and obtained a captaincy in Pulaski's Legion. He rose to be colonel and commissary and served throughout the Revolutionary War. Davie sat in the North Carolina legislature from 1786 to 1798. Through his influence the University of North Carolina was established in 1789. He was elected governor of that state in 1798, but served only a few months, resigning to be a member of the embassy to France which resulted in the convention of Sept. 30, 1800.

DAVIES, dā'vêz, Arthur Bowen, American landscape and figure painter: b. Utica, N. Y., Sept. 26, 1862; d. Florence, Italy, Oct. 24, 1928. After studies at the Chicago Art Institute and in New York City, he worked as an illustrator for *Saint Nicholas* magazine (1888–1891). He was a representative of the romantic school. He is represented in the permanent collections of the Art Institute of Chicago and the Metropolitan Museum, New York City. His important works include *Spring's Renewal* (1901); *The Breath of Light* (1901); *The Girdle of Ares* (1908, Metropolitan Museum, New York); *Visions of the Sea* (1911); *The Hunter of the Starlands*; *Maya*, *Mirror of Illusions* (Chicago Art Institute); *Children of Yesteryear* (Brooklyn Museum of Art). He showed at one time pronounced cubist tendencies in a series of paintings, of which the most important is *The Great Mother* (1914).

DAVIES, Clara Novello (nee DAVIES), British choral conductor: b. Cardiff, Wales, April 7, 1861; d. London, England, Feb. 7, 1943. A specialist in building voice and in control of breath, she founded and conducted the Royal Welsh Ladies' Choir, which won highest honors at the Chicago World's Fair in 1893 and at the Paris Exposition in 1900. Her choir sang before British royalty in 1894 and in 1928 and reappeared at the Paris Exposition of 1937. Among her many publications are *You Can Sing* (London 1931) and *Life I Have Loved* (London 1940).

DAVIES, Sir Henry Walford, English organist and composer: b. Oswestry, Shropshire, England, Sept. 6, 1869; d. near Bristol, March 11, 1941. He was organist and choral director of the Temple Church, London (1898-1923); chairman of the National Council of Music for Wales (1919-1941); professor of music in the University of London (1924-1941); organist of St. George's Chapel, Windsor (1927-1932); and master of the king's music (1934-1941). He was knighted in 1922 and created knight commander of the Victorian Order in 1937. His creative work included symphonies, cantatas (of which the best known is his setting of *Everyman* in 1904), and many pieces of church music. He also edited many hymnals and song books. His broadcast talks on music, begun in 1924, were extremely popular.

DAVIES, Hubert Henry, English dramatist: b. Cheshire, England, March 17, 1876; d. Robin Hood's Bay, Yorkshire, Aug. 17, 1917. He visited the United States in 1893 and spent some years as a journalist in San Francisco. Returning to England in 1901, he wrote *Cousin Kate* (1903), the first of several popular comedies. Its success was repeated in an American production. It was followed by *Cynthia* (1904), *The Mollusc* (1907), *Doormats* (1913), and *Outcast* (1914). At the outbreak of World War I he enlisted as a hospital orderly. Serving in France for nearly three years, he suffered a breakdown and died in England.

DAVIES, Sir John, English poet and lawyer: b. Tisbury, Wiltshire, England, baptized April 16, 1569; d. London, Dec. 8, 1626. He served James I as a zealous officer of the crown in the effort to establish Protestantism in Ulster, being solicitor general for Ireland (1603) and later (1606) attorney general. He was speaker of the Irish Parliament from 1613 to 1619. On returning to England he entered Parliament in 1621 and was appointed lord chief justice in 1626, but died before he could take office. His writings include a poem on dancing, *Orchestra* (1594), a philosophical poem, *Nosce Teipsum* (1599), *Hymns to Astraea* (1599), contributions to Francis Davison's *Poetical Rapsody* (2d ed., 1608), *Reports of Cases Adjudged in the King's Courts in Ireland* (1615), and political tracts.

DAVIES, Joseph Edward, American lawyer and diplomat: b. Watertown, Wis., Nov. 29, 1876. Educated at the University of Wisconsin, he practiced law in that state (1902-1913) and in Washington, D.C. (1918-1936). He was commissioner of the United States Bureau of Corporations (1913-1915) and chairman of the Federal Trade Commission (1915-1916). Appointed United States ambassador to Russia in 1936, he spent two years in that post, later describing his

experiences in a much discussed book, *Mission to Moscow* (1941). He served also as United States ambassador to Belgium and minister to Luxembourg (1938-1939) and as chairman of the President's War Relief Control Board (1942-1946).

DAVIES, Sir Louis Henry, Canadian jurist: b. Charlottetown, Prince Edward Island, Canada, May 4, 1845; d. Ottawa, May 1, 1924. He was solicitor general and later attorney general of Prince Edward Island, member of the provincial legislature (1872-1879), and provincial premier (1876-1879). He sat as a Liberal in the Canadian House of Commons (1882-1901) and then was appointed a judge of the Canadian Supreme Court, of which he became chief justice (1918). He was created knight commander of the Order of St. Michael and St. George (1897) and an imperial privy councilor (1919).

DAVIES, Samuel, American clergyman: b. New Castle County, Del., Nov. 3, 1723; d. Princeton, N. J., Feb. 4, 1761. Upon his ordination in 1746 he was sent to Virginia, where he founded the presbytery of Hanover County. The foremost pulpit orator of his generation, he was eloquent also in civil controversies as a leader in the movement for religious and political freedom. While visiting England with Gilbert Tennant in 1753, he preached some 60 sermons in Scottish and English pulpits and raised £3,000 for the College of New Jersey (now Princeton University). Upon the death of Jonathan Edwards in 1759, he was elected to the presidency of the college, whose standards for admission and graduation he raised.

DAVIES, William Henry, English poet and writer: b. Newport, Monmouthshire, England, April 20, 1871; d. Nailsworth, Gloucestershire, Sept. 26, 1940. Apprenticed to a picture-frame maker, he left this trade and adopted for some eight years the life of a peddler and street singer. Traveling on cattle boats, he made several visits to North America, gathering material in the United States and Canada which he used in his best-known book, *The Autobiography of a Super-Tramp* (1908), and in *The Adventures of Johnny Walker, Tramp* (1926). His first published verses, *The Soul's Destroyer*, appeared in 1905 and attracted the interest of George Bernard Shaw, who wrote a preface to the *Autobiography*. His books of verse include *Nature Poems* (1908), *Songs of Joy* (1911), *Raptures* (1918), *Hour of Magic and Other Poems* (1922), *A Poet's Alphabet* (1925), and *Love Poem* (1935).

DAVILA, dā'vê-lä, Carlos Guillermo, Chilean editor and diplomat: b. Los Angeles, Bio-Bio, Chile, Sept. 15, 1887. His journalistic career began on the *El Mercurio* (1912-1916), which he left to edit *La Nación* (1917-1927). After acting as Chilean ambassador to the United States (1927-1931), he became editor of *Hoy* (1931-1932). A leader in the coup d'état which ousted President Juan Esteban Montero (June 1932), he was provisional president of Chile during the formation of a new government. Then (1933-1938) Dávila in New York directed the Editors' Press Service, which distributes news throughout Latin America. In 1953 he led a mission of the United Nations on a survey tour of Latin America. Recalled by his government in 1954, he was given the directorship of the government-owned journal *La Nación*, which he had edited. His book *We of the Amer-*

icas (New York 1949) urges hemispheric solidarity for the Americas.

DAVILA, Enrico Caterino, Italian statesman and historian: b. Piove di Sacco, near Padua, Italy, Oct. 30, 1576; d. near Verona, Aug. 8, 1631. About 1583 he was introduced by his father at the French court, where he remained and entered the service of France. He fought in the civil wars (1594–1598), which he described in the celebrated *Historia della Guerre Civili di Francia* (1630). It was translated into French (1642), English (1647; 1666), Spanish (1651), and Latin (1745). Returning to Italy in 1599, he served Venice as governor of Candia, Crema, Dalmatia, and Friuli. He had been appointed governor of Brescia when he was murdered in 1631.

DAVILA, Gil Gonzalez. See AVILA, GIL GONZALEZ DE.

DAVILA, Pedrarias. See PEDRARIAS DAVILA.

DAVILA Y PADILLA, è pa-thē' (1) ya, **Agustín**, Mexican prelate and historian: b. Mexico City, Mexico, 1562; d. Santo Domingo, 1604. After graduation from the University of Mexico he entered the Dominican Order in 1579. He was court preacher at Madrid (1598) and bishop of Santo Domingo (1599–1604). His chief work was the *Historia de la Fundación y Discurso de la Provincia de Santiago de Méjico de la Orden de Predicadores* (1596; reprinted under the title *Historia de la Nueva España* (1938)). It still is the best chronicle of the Dominicans' American missions during the 16th century.

DAVIN, dā'vīn, Nicholas Flood, Irish-Canadian lawyer, journalist, and politician: b. Kilfinane, County Limerick, Ireland, Jan. 13, 1843; d. Winnipeg, Manitoba, Canada, Oct. 18, 1901. Educated at Queen's College, Cork, Ireland, and the University of London, he was called to the English bar in 1868. Davin was a war correspondent during the Franco-Prussian War (1870–1871) and joined the staff of the *Toronto Globe* in 1872. Called to the Ontario bar in 1874, he moved west in 1883 and established the *Regina Leader*. Davin served in the Canadian House of Commons, 1887–1900, as a strong champion of western Canadian interests. His works include *The Irishman in Canada* (1877) and *Eos, An Epic of the Dawn* (1889).

DA VINCI, Leonardo. See VINCI, LEONARDO DA.

DAVIS, dā'vis, Alexander Jackson, American architect: b. New York, N. Y., July 24, 1803; d. Llewellyn Park, West Orange, N. J., Jan. 14, 1892. He formed with Ithiel Town a partnership (1829–1843) which produced many buildings in the classic style of the period, among which were the capitol buildings of North Carolina (in association with David Paton, 1831), Indiana (1832–1835), Illinois (1837), and Ohio (with three other architects, 1839); the New York Customs House (1832); and the Patent Office, Washington, D.C. (1832). Independently he planned the Assembly Hall for the University of North Carolina (1844), buildings for the Virginia Military Institute (1852, 1859), many churches, houses, and other buildings. He was a founder of the American Institute of Architects (1857). He retired in 1880.

DAVIS, Arthur Hoey, Australian editor and author: b. Drayton, Queensland, Australia, Nov. 14, 1868. He founded in 1903 *Steele Rudd's Magazine* as a vehicle for his vivid descriptions of Australian life in the "back country," which brought him wide acclaim as "the Mark Twain of Australia." The encouragement which the magazine gave to young writers helped to establish a distinctive school of Australian fiction. His best known works, under the pseudonym Steele Rudd, are *On Our Selection* (1899), *Our New Selection* (1903), *We Kaytons* (1921), and *Green Grey Homestead* (1935).

DAVIS, Arthur Powell, American civil engineer: b. Decatur, Ill., Feb. 9, 1861; d. Oakland, Calif., Aug. 7, 1933. As a topographer with the United States Geological Survey (1884–1894), he conducted surveys in Arizona, New Mexico, and California. During 1898–1901 he made hydrographic examinations of the proposed routes of the Nicaragua and Panama canals. In 1903 he joined the United States Reclamation Service, of which he was successively supervising engineer (until 1906), chief engineer (1906–1914), and director (1914–1923). In 1930 he became chief consulting engineer of the \$300 million irrigation project planned in Turkestan and Transcaucasia. His publications include *Irrigation Works Constructed by the United States Government* (1917).

DAVIS, Bette (real name RUTH ELIZABETH DAVIS), American motion picture actress: b. Lowell, Mass., April 5, 1908. Educated at the Cushing Academy, Ashburnham, Mass., her first acting experience was in school plays. After a brief career in the theater she began motion picture work in Hollywood, Calif., in 1930. The Academy of Motion Picture Arts and Sciences awarded her its annual award of 1935 and of 1938, as the best actress of the year, and in 1940 elected her its president, the first woman to hold that office.

DAVIS, Charles Harold, American painter: b. Amesbury, Mass., Jan. 7, 1856; d. Mystic, Conn., Aug. 5, 1933. He studied art in Boston, Mass., and in Paris, France, from 1880 to 1890, returning to the United States to become a leading landscape painter in the French style of his day. He was awarded medals and prizes at many exhibitions. His works are in the Metropolitan Museum, New York City, and other institutions.

DAVIS, Charles Henry, United States naval officer: b. Boston, Mass., Jan. 16, 1807; d. Washington, D.C., Feb. 18, 1877. Having entered the United States Navy as midshipman (1823), he became a commander (1854) before the Civil War, during which he rose to be a rear admiral (1863). In command of the Upper Mississippi gunboat flotilla, Davis participated in the Confederate fleet's defeat before Memphis (1862) and in the operations with Rear Admiral Farragut's fleet around Vicksburg (1862). Thereafter his service included tours as chief of the Bureau of Navigation (1862–1865) and superintendent of the Naval Observatory (1865–1867, 1873–1877).

DAVIS, Cushman Kellogg, American legislator: b. Henderson, N. Y., June 16, 1838; d. St. Paul, Minn., Nov. 27, 1900. After graduation from the University of Michigan (1857), he practiced law until he was commissioned first lieu-

tenant in the 28th Wisconsin Infantry (1862). During the Civil War he was judge advocate and for a time adjutant general on the staff of Gen. Willis Arnold Gorman. Davis was elected to the Minnesota legislature (1867) and served as governor (1874-1876) and as United States senator (1888-1900). After the war with Spain he served with Whitelaw Reid and William Pierce Frye on the peace commission in Paris (1898).

DAVIS, David, American jurist: b. Cecil County, Md., March 9, 1815; d. Bloomington, Ill., June 26, 1886. He was graduated from Yale Law School (1835) and then practiced law in the pioneer town of Bloomington, Ill. From 1848 to 1862 he presided over the eighth judicial circuit in Illinois. Among the lawyers who appeared before him was Abraham Lincoln; the two men became close friends and Davis was credited with having done more than any other man to secure Lincoln's nomination in 1860. Lincoln appointed him to the United States Supreme Court, where he served from 1862 to 1877, when he resigned to enter the United States Senate, where he served until 1883.

DAVIS, Dwight Filley, American public official: b. St. Louis, Mo., July 5, 1879; d. Washington, D.C., Nov. 28, 1945. Distinguished by a brilliant military record in World War I and for service in high government offices thereafter, his name is identified in the public mind with the Davis Cup, which he donated in 1900 and which became the most prized team trophy in international tennis. He was graduated in 1900 from Harvard, where he was an intercollegiate tennis champion, and from Washington University Law School in 1903. He was active for many years in public life in his native city; as parks commissioner he instituted an extensive development of municipal playgrounds and tennis courts.

Davis attended the first military training camp at Plattsburg, N. Y., in 1915 and upon the entrance of the United States into the war enlisted as a private in the 5th Missouri Infantry. He received a captaincy in 1917, rose to major and lieutenant colonel, served as assistant chief of staff of the 35th Division, and took part in the St. Mihiel and Argonne offensives. He was twice decorated, receiving the Distinguished Service Cross for extraordinary heroism in action. During World War II he served as an advisor to the Army Service Forces.

Davis was a candidate in 1920 for the Republican nomination for United States senator from Missouri, but was defeated. He served as director of the War Finance Corporation (1921-1923), assistant secretary of war (1923-1925), secretary of war (1925-1929), governor general of the Philippine Islands (1929-1932).

DAVIS, Edwin Hamilton, American physician and archaeologist: b. Ross County, Ohio, Jan. 22, 1811; d. New York, N. Y., May 15, 1888. He was graduated at the Cincinnati Medical College about 1838 and practiced medicine in Chillicothe, Ohio, until 1850, when he accepted the chair of materia medica and therapeutics at New York Medical College, where he taught for 10 years. With Ephraim George Squier he surveyed 100 of the Indian mound builders' earthworks and described these in *Ancient Monuments of the Mississippi Valley* (1847), the first work issued by the newly formed Smithsonian Institution.

DAVIS, George Whitefield, United States army officer: b. Thompson, Conn., July 26, 1839; d. July 12, 1918. On the outbreak of the Civil War he enlisted in the 11th Connecticut Infantry, took part in the campaign against Richmond, and rose to a majority. After the war he was commissioned captain of infantry in the Regular Army (1867), received regular promotions, and retired in 1903 with rank of major general. A self-taught engineer, he was granted leave from the army to become general manager of the Nicaragua Canal Construction Company (1890-1893). Davis commanded the department of Pinar del Río in Cuba (1898), was military governor of Puerto Rico (1899-1900), and commanded a United States division in the Philippines (1902). He was a member of the Isthmian Canal Commission (1904) and governor of the Canal Zone (1904-1905). He was president of the board which published the *Official Records* of the Civil War (1895-1898) and he wrote the history of the military governments of Puerto Rico (1899) and Manila (1902).

DAVIS, Harold Lenoir, American author: b. Yoncalla, Ore., Oct. 18, 1896. At the age of nine he went to work on a country newspaper in Oregon, where his Tennesseean forebears had settled after the Civil War. He was at times a shepherd, surveyor, bank clerk, timekeeper on a railroad track gang, deputy county sheriff, editor of the *Antelope*, Ore., *Herald*, and singer of folk songs on a northwestern radio network. He began writing verse while in the United States Army, which he joined in World War I, and won the Levinson Prize for poetry in 1919. Turning to prose, he wrote *Honey in the Horn* (1935), dealing with the lives of Western homesteaders, which won the Harper and Pulitzer prizes.

DAVIS, Henry Gassaway, American capitalist and legislator: b. Woodstock, Md., Nov. 16, 1823; d. Washington, D.C., March 11, 1916. From a brakeman on the Baltimore and Ohio Railroad, he rose to prominence and wealth in West Virginia, where he built and managed several railroads and organized the Davis Trust Company. He was elected as a Democrat to the West Virginia House of Delegates in 1865, to the state senate in 1868 and 1870, and in 1871 to the United States Senate, where he served until 1883. In 1904 he was the Democrats' candidate for the vice presidency of the United States.

DAVIS, Henry William Carless, British historian: b. Ebley, Gloucestershire, England, Jan. 13, 1874; d. Edinburgh, Scotland, June 28, 1928. He was educated at Oxford, where he was fellow of several colleges (1895-1921) and regius professor of modern history (1925-1928). His published works include *England Under the Normans and Angevins* (1905; 13th ed. 1949), *Medieval Europe* (1911), and *Medieval England* (1924). He edited a revision of William Stubbs' *Select Charters* (1913) and published the first volume of *Regesta Regum Anglo-Normannorum* (1913). From 1919 Davis edited the *Dictionary of National Biography*.

DAVIS, Henry Winter, American statesman and orator: b. Annapolis, Md., Aug. 16, 1817; d. Baltimore, Md., Dec. 30, 1865. He was elected to Congress for four terms (1855-1861, 1863-1865) and became a national figure by his success-

ful efforts to prevent the secession of Maryland from the Union. With Benjamin Franklin Wade he composed the famous "Wade-Davis Manifesto" (1864), which attacked the administration's policy on reconstruction of the South. In eloquent opposition he advanced his own harsh plan, which easily passed both houses of Congress, but was nullified by President Lincoln with a pocket veto.

DAVIS, James John, American politician: b. Tredegar, Wales, 1873; d. Tokoma, Md., Nov. 22, 1947. The son of immigrant parents, he began work at the age of 11 in an iron and steel plant at Pittsburgh, Pa. Moving to Elwood, Ind., he became active in local and state politics. In 1906 he was appointed director general of the Loyal Order of Moose, whose membership under his regime rose to over 600,000. Davis was secretary of labor (1921-1930) and United States senator from Pennsylvania (1930-1945). He described his early years in *The Iron Puddler* (1922).

DAVIS, Jefferson, American statesman and president of the Confederacy: b. Christian (now Todd) County, Ky., June 3, 1808, d. New Orleans, La., December 6, 1889. Jane Cook added her Scotch-Irish heritage to the Welsh of Samuel Davis and the union produced 10 children, the youngest of whom was Jefferson Davis. A few years after his birth the family settled in the new, but already prosperous, cotton region of Wilkinson County, Miss. After a year of the local log cabin school had convinced his father that the educational opportunity necessary to his son's development could not be found on the frontier, young Jefferson studied for the next three years at a Dominican school in Kentucky before returning home to continue his work in nearby private academies. At 13 Davis entered Transylvania College, Kentucky, and had completed his junior year when his already prominent brother, Joseph, secured him an appointment to West Point. His record at the Military Academy was not distinguished; he graduated 23d in a class of 33, and his drinking in a public tavern and other escapades brought more than the average number of demerits. At West Point he enjoyed a close friendship with Albert S. Johnston and Leonidas Polk, knew slightly Robert E. Lee and Joseph E. Johnston, and developed an abiding interest in military affairs, philosophy, and history.

After graduation in 1828 Davis served as a lieutenant on the northwestern frontier. There he met and won Sarah Knox, daughter of his commander, Col. Zachary Taylor. But Jefferson's attentions to an Indian girl at a dance and his opposition to his prospective father's policies angered the colonel. The Black Hawk War (1832) gave Davis his first military experience and first acquaintance with a tall, awkward captain of militia, Abraham Lincoln. In 1835 Davis won Taylor's reluctant consent, married Sarah Knox, resigned his commission, and settled as a cotton-planter in Mississippi on almost 1,000 acres given him by Joseph. Less than three months after the wedding, Sarah Knox died of fever and Davis found release in developing "Brierfield" plantation. He secured more than 30 slaves and created a democracy within slavery by his treatment of them. He was never a large slaveholder and he always saw slavery in its most ideal light. He held himself accountable both for the well-being of his slaves and for their training in responsibility. Yet he believed that God created Negroes

inferior to whites and that neither education nor environment could counteract the divine intent. Though deeply religious, rather than seeing the conflict between Christianity and human bondage, Davis found justification in the Old Testament for slavery. The profits from "Brierfield" and the relative contentment of his slaves supported his convictions.

Political Beginnings.—By 1843 his reputation as a scholar together with the tradition of planter participation in politics, won Davis a last minute Democratic nomination for the state legislature. His brief but intensive campaign gained an impressive, though not victorious, vote in a strong Whig county. He broke with his party's stand on repudiation of the Union Bank bonds, but political enemies later repeatedly and falsely accused him of being a repudiator. As a Polk and Dallas elector, he canvassed the state in 1844, found an issue to his liking in territorial expansion, and proved himself a strong and popular orator. The following year Davis married Varina Howell, received the nomination for the House of Representatives, and won by advocating sound currency, low tariff, and territorial expansion. The latter issue was the central theme of the 29th Congress and Davis delivered his maiden speech on the Oregon question (q.v.), joining forces with Southerners who urged moderation and compromise rather than war with Great Britain. But his stay in the House was short, for he accepted the command of the Mississippi Rifles and by August 1846 was leading them into Mexico.

At the Battle of Monterey, Colonel Davis won respect for his personal bravery; at Buena Vista, he demonstrated both courage and ability in the heroic stand of his regiment. A painful foot wound sent the hero home, where newspaper accounts, resolutions of state legislatures, and the sight of him hobbling on crutches enhanced his military reputation and speeded his political advance.

Service as Senator.—In 1847 Davis was appointed by the governor of Mississippi to the vacancy in the United States Senate created by Senator Jesse Speight's death and in the next year the Mississippi legislature elected him for the remainder of the unexpired term. As a member of the Committee on Military Affairs he joined its chairman, Lewis Cass, in supporting expansion and enlarging the army. Already the young Mississippi senator foresaw a railroad spanning the continent and a Panama railway to promote commerce and make secure Pacific coast defenses. Yet, little by little, Davis became more and more a sectionalist and less a nationalist. The Wilmot Proviso and the Compromise of 1850 (qq.v.) turned his energies toward the defense of the South's peculiar institution. He envisioned no relief in Calhoun's discredited nullification, but held that the Union was composed of sovereign independent states, voluntarily confederated, and free to resume their sovereignty. Thus secession was not revolution but a legal remedy. Davis favored preservation of the Union, if the Constitution remained "in the form and with the meaning it had when it left the hands of its authors." The federal government should respect the right of property in slaves; any interference with it was unconstitutional and a threat to state sovereignty. Davis voiced his convictions well and was an excellent debater, but in his constitutional theories he looked to what had been and closed his eyes to custom and practice that had already brought

a changed interpretation of the Constitution to a majority of Americans. He opposed the Compromise of 1850, held that a strict fugitive slave law could not be enforced in face of adverse public opinion, that the states alone could exclude slavery from the territories, and that the Missouri Compromise line should be extended to the Pacific. After passage of the Compromise of 1850, Davis signed a vigorous protest, and notwithstanding his recent election to a six-year term in the Senate, resigned (1851) to accept the Democratic nomination for the governorship of Mississippi. Against his opponent, Henry S. Foote, he waged a strong campaign, but by a narrow vote Mississippi rejected his radical position. Defeated, discredited, and dismayed, Davis returned to his plantation until his interest in Franklin Pierce's candidacy brought him back to politics. President Pierce offered, then urged him to accept, a cabinet position.

Secretary of War.—In this post Davis reached the apex of his national career. Henceforth he worked to protect slavery within the Union, and in his direction of the War Department he was more of a nationalist than a sectionalist. He revised military regulations, replaced wood gun-carriages with iron, adopted a better system of infantry tactics, provided rifles, pistols, and the Minié ball, used large-grain powder, and created the medical service. The Military Academy was enlarged, four regiments were added to the army, and seacoastal and frontier defenses were strengthened. These reforms, plus increased pay, endeared Davis to the military, but he failed in the attempt to make merit rather than seniority the basis for promotion. His introduction of camels for transportation in the West was interesting but ineffectual. As secretary he had charge of enlarging the Capitol building and constructing "Cabin John" viaduct, which provided a better water system for Washington. Undoubtedly his greatest contribution was the survey of routes for western railways and the resulting detailed reports, which not only laid the basis for future railroads but also emphasized the importance of the great West. The strict constructionist Davis advocated federal land grants and bonds to encourage railroad construction, on the ground that transcontinental routes were necessary for national defense and thus within the war powers of the president. Davis favored the Southern route to the West and was instrumental in securing the Gadsden Purchase (q.v.) from Mexico. He looked with favor on the acquisition of Cuba and supported schemes to get territorial rights in Nicaragua.

Renewed Service in the Senate.—On the expiration of his term as secretary (1853–1857) Davis was elected to the Senate and returned to that body as the recognized spokesman of the South. An unfortunate illness in 1857 and the beginning of a serious decline in health forced an extended vacation. From 1858 through 1860 he openly and defiantly served the cause of slavery extension and proclaimed slavery both an economic and a moral good. At the same time he evidenced a sincere love of the Union and an unwillingness to see it broken by radical Northern or Southern action. By 1860 Davis represented the Southern wing of the Democratic Party and on February 2 introduced resolutions which became the platform of most Southern men. In them he reiterated that the Federal Constitution was adopted by free and independent sovereign states, protested that Negro slavery was

recognized as legitimate and attacks on it were manifest breaches of good faith, and declared that neither Congress nor a territorial legislature could impair the right of a citizen to move freely with his property in common territories and therefore it was the duty of Congress to provide adequate protection for slave property. This doctrine of congressional protection of slavery in territories was accepted as the minority platform at the Charleston Democratic Convention; upon adoption of the majority report supported by Stephen A. Douglas, eight Southern states left the convention. Davis eventually favored John C. Breckinridge in the campaign of 1860 and after the election of Abraham Lincoln was no more than a cooperative secessionist. He held that the Southern states should meet to determine a new policy and repeatedly warned that there could be no peaceful secession. Davis served on the Senate Committee of Thirteen (Crittenden) and favored compromise, but, seeing no prospects of it, voted against the committee report. By Jan. 5, 1861, he joined other Southern senators in urging each state to secede as soon as possible and to provide the means of organizing a Southern Confederacy. Yet at this late date he realized the danger in leaving the Union and saw advantage to the South in keeping Southern senators and representatives in Congress. After Mississippi had seceded, Davis resigned and returned home, where he accepted the rank of major general and the command of his state's military forces before he was informed of his selection by the Provisional Congress as President of the Confederacy. Reluctantly he left for Montgomery, Ala., and the impossible task ahead, for he had hoped for and would have preferred an army command. Davis was over six feet in height, his body erect and worn thin by work, worry, and disease; his jaws were strong, slight hollows appeared in his cheeks, and he was blind in one eye. He often suffered from an extremely painful form of neuralgia and his nervous system was acutely sensitive. In contrast to Lincoln, he was graceful in movement and highly educated, but he could not approach Lincoln's simplicity, sincere eloquence, deep love for humanity, and insight into fundamental problems. Criticism stung Davis to the quick and he lacked Lincoln's singleness of purpose which enabled him to dismiss detractors for the good of a cause. Yet for all his apparent physical handicaps, Davis pushed himself unmercifully and his excellent voice often brought enthusiastic response.

President of the Confederacy.—Davis entered the presidency of the Confederacy (Feb. 18, 1861) confident that law and right were on his side and equally convinced that the major force was on the other. Behind him he had little more than 9 million people, including slaves, and woefully inadequate industrial facilities in contrast to the North's 22 millions, extensive industry, and almost unlimited possibilities for men and matériel. Davis therefore pressed preparation for war, while planning no overt act to give the North cause for war. He selected his cabinet with due regard to geography, personality, political connection, and ability. In Judah P. Benjamin, Stephen R. Mallory, and John H. Reagan, he found men of outstanding ability who remained with him throughout the Confederacy. Christopher G. Memminger and George A. Trenholm as secretaries of the treasury directed the department well—considering the financial deficiencies of the South. Eleven other men served in the cabinet,

most of whom resigned because of personal ambition or congressional opposition. The Southern leaders' advantages lay in having citizens accustomed to outdoor life and trained in the use of firearms, excellent military officers, a defensive position, and slaves who remained loyal and economically productive. Though anxious to avoid a test of strength, the course of events forced Davis to consent to the bombardment of Fort Sumter, S. C. (April 12-13, 1861), which gave Lincoln opportunity to accuse the South of aggression.

The Military Problem of the South.—Davis and his cabinet used Southern resources well. Approximately 900,000 men volunteered or were conscripted for the army; ordnance and munition works were constructed so rapidly that no Southern army really suffered a lack of these supplies; a poor transportation system was pieced together; scrap iron and captured steam engines were converted into a modern navy, whose ironclad ships and torpedoes lessened the effectiveness of the Northern blockade, enabling the South to obtain essential supplies by blockade runners from abroad. Confederate cruisers roamed the seas, effectively destroying Union carrying trade.

Excess cotton and the failure of England and France to demand it at the possible cost of war created a problem, because the blockade limited cotton's expected value as a source of exchange and made it impossible for the debtor South to finance an extended war. Yet cotton became the medium of exchange for matériel secured by blockade-running and secured one foreign loan.

Southern opposition to heavy taxation, together with an inability to buy bonds, forced the financing of war with fiat money. The resulting progressive depreciation of the currency created a morale problem and made necessary taxation in kind and impressment of commodities at fixed prices.

In foreign affairs Davis and Benjamin pushed every conceivable advantage, but for many reasons, including her critical need of Northern wheat, Great Britain refused recognition and France feared to act alone.

From first to last, severe criticism fell on Davis. His accusers blamed him for the inadequacies of the South, charged him with being a dictator, condemned him for interfering with military commanders, criticized his appointments, and demanded an offensive rather than a defensive military policy.

With few exceptions, including his blind faith in Braxton Bragg and the removal of Joseph E. Johnston, Davis selected his officers intelligently; and Lee's army, which he visited and with which he interfered most often, had more successes than any other. Perhaps his greatest mistake lay in overemphasis on the defense of Richmond, Va., and a failure to recognize the importance of the West. He probed the relative merits of East and West in 1863 and eventually supported Lee's planned invasion rather than the reinforcement of Vicksburg, Miss. The degree of congressional opposition was indicated by his 39 veto messages, and, although the Congress could override none of these vetoes, by 1865 Davis lost confidence of Congress and the public. Opposition of Georgia's and North Carolina's governors, widespread desertions, and capture of the last port of entry, forced approval of arming Negroes. But before this became reality, the Confederacy fell.

In Defeat.—On April 3, 1865, Davis and his

cabinet fled Richmond (stopping briefly in Danville, Va., and Greensboro, N. C.) and at Charlotte, S. C., operated as a government for the last time. Davis sped from Charlotte through South Carolina and into Georgia, ostensibly headed for the trans-Mississippi region and continued resistance, but actually loitered in Georgia awaiting capture, knowing that the Confederacy was at an end. On May 10 he was taken at Irwinville, Ga., accused of treason and of participation in planning the assassination of Lincoln, and imprisoned at Fortress Monroe, Va. For a time he wore leg shackles and this, with other harsh treatment, restored his popularity in the South and made him, second to Lee, a symbol of the Confederacy. Though twice indicted, he was never brought to trial, and in two years joined the other Southern leaders in their freedom (May 13, 1867). That only Capt. Henry Wirz, commandant of Andersonville prison, suffered execution as a result of so long and bloody a war is remarkable in the annals of history.

The Remaining Years.—Davis devoted almost 25 years as a defender and apologist of the South. Between repeated trips to Europe, he refused the presidency of Randolph Macon College, became the president of the Carolina Life Insurance Company, and planned a treatise on the Confederacy. Failure of the insurance company and of an English scheme to develop a settlement in the Mississippi Valley, from which Davis expected a lucrative job, left him in straitened financial circumstances, which the gift of "Beauvoir" at Biloxi, Miss., eased. There he collected material for his *The Rise and Fall of the Confederate Government* (1881) and wrote an excellent exposition of the Southern point of view and a justification of secession. Yet, much of his writing was special pleading rather than history and was disappointing in its meager revelations of intimate associations during the war years. Davis accepted few of the numerous invitations for speeches; but, whenever he spoke, he stressed the right of secession, the justice of the Confederate cause, and on occasion disparaged the federal government. Acrimonious controversies with former Confederates such as Gen. Joseph E. Johnston and Northerners such as Gen. William T. Sherman clouded his declining years. He rejected a lucrative offer from the Louisiana Lottery, but was severely criticized for upholding individual freedom as against prohibition. In 1886 he received triumphal ovations after speeches and appearances in Montgomery, Ala., Atlanta, Ga., and Savannah, Ga. He remained the sharp-tongued defender of the Confederacy, but by his 80th year he had apparently mellowed. He never requested or received a pardon, yet stated in a speech at Mississippi City, Miss.: "The past is dead; let it bury its dead, its hopes, and its aspirations; before you lies the future—a future full of golden promise, a future of expanding national glory, before which all the world shall stand amazed." In November 1889, while visiting "Brierfield," he became ill and returned as far as New Orleans, La., where he died. His body was buried in Metairie Cemetery and four years later was removed to a hillside in Hollywood Cemetery, Richmond, Va.

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REMBERT W. PATRICK,

Professor and Head, Department of History, University of Florida.

DAVIS, Jefferson Columbus, United States army officer: b. Clark County, Ind., March 2, 1828; d. Chicago, Ill., Nov. 30, 1879. He left school for the Mexican War, in which he received a commission for gallantry. He was with the garrison at Fort Sumter, S. C., as first lieutenant when its bombardment began the Civil War. He received the brevet of brigadier general of volunteers and a colonelcy in the Regular Army for distinguished service on the Union side. After the war he was stationed on the Pacific coast, where he concluded the Modoc War (1872-1873) in California and was the first United States Army officer to hold command in Alaska, where Port Davis was named after him in 1900.

DAVIS, John, English navigator: b. Sandridge, near Dartmouth, Devonshire, c.1550; d. near Bintan, off Malay Peninsula, Dec. 29 or 30, 1605. In 1585 he sailed to find a northwest passage through the American Arctic Ocean and later explored the coasts of Greenland, proceeding as far as 73° north latitude in 1587, and discovered the strait named after him. He made four voyages to the East Indies, on the last of which he was killed in an engagement with Japanese pirates. He wrote an account of his voyages and invented a quadrant.

DAVIS, John Chandler Bancroft, American diplomat and jurist: b. Worcester, Mass., Dec. 29, 1822; d. Washington, D.C., Dec. 27, 1907. Educated at Harvard University (1837-1840), he then studied and practiced law. He served in London (1849-1853) as secretary of the United States legation. From 1854 to 1861 he was American correspondent of the *London Times*. During 1869-1871 and 1873-1874 he was assistant secretary of state. He represented the United States in the *Alabama* contest, zealously pushing the "indirect" claims; was minister to Germany, 1874-1877; judge of the United States Court of Claims, 1878-1883; and reporter of the United States Supreme Court, 1883-1902. His publications include *The Massachusetts Justice* (1847) and *Mr. Fish and the "Alabama" Claims* (1893).

DAVIS, John William, American lawyer and public official: b. Clarksburg, W. Va., April 13, 1873; d. Charleston, S. C., March 24, 1955. The son of a prominent West Virginian lawyer, he was graduated from Washington and Lee University in 1892, took his bachelor's degree in law there in 1895, and was admitted to the bar. In 1899 Davis was elected to the West Virginia House of Delegates. Elected to Congress (1911-1915) from the 1st West Virginia District, he resigned on being appointed in 1913 solicitor general of the United States, a post which he occupied until 1918, at the same time serving as counselor of the American Red Cross. In September 1918 he was one of the United States delegates at a conference in Berne, Switzerland, with the Germans on treatment and exchange of prisoners. Davis served as

ambassador to Great Britain from 1918 to 1921 and in 1922 was elected president of the American Bar Association. In 1924 he won the Democratic nomination for the presidency, but was defeated in the election by Calvin Coolidge. Davis appeared before the United States Supreme Court 140 times—more than any other attorney in the nation's history.

DAVIS, Katherine Bement, American sociologist: b. Buffalo, N. Y., Jan 15, 1860; d. Pacific Grove, Calif., Dec. 10, 1935. She graduated at Vassar College in 1892 and studied at the University of Chicago, where she earned a doctorate in 1900. During 1892-1897 she was headworker at the College Settlement in Philadelphia. From 1901 to 1914 she was superintendent of the New York State Reformatory for Girls at Bedford Hills and by her scientific methods made it a noteworthy experiment in penology. From 1914-1915 she was commissioner of correction for New York, N. Y., and was the first woman to hold this office. From 1915 to 1917 she was chairman of the New York City Parole Commission. She was general secretary of the Bureau of Social Hygiene, New York, N. Y., from 1918 until her retirement in 1928.

DAVIS, Noah Knowles, American philosophical writer: b. Philadelphia, Pa., May 15, 1830; d. Charlottesville, Va., May 3, 1910. Graduated from Mercer College (now University) in 1849, he taught at various Baptist colleges for about 20 years and finally was professor of philosophy at the University of Virginia from 1873 to 1906. Among his published writings are *The Theory of Thought* (1880), *Elements of Deductive Logic* (1890), *Elements of Psychology* (1892), *Elements of Inductive Logic* (1895), *Elements of Ethics* (1900).

DAVIS, Norman Hezekiah, American public official and diplomat: b. Bedford County, Tenn., Aug. 9, 1878; d. Hot Springs, Va., July 1, 1944. He studied at Vanderbilt and Leland Stanford universities and returned to Tennessee, where he managed a farm, bought an interest in an overalls factory, and studied law. He accepted a business position in 1902 in Cuba, where he became interested in banking, sugar, and other local enterprises. In 1905 he organized the Trust Company of Cuba, of which he was president until 1917. Having acquired a modest fortune, he withdrew from business affairs and devoted himself henceforth to public service. In 1917 he was a consultant of the Treasury Department on foreign loans and in 1918 was sent abroad as President Wilson's personal emissary. During the Wilson administration Davis served as financial adviser at the Versailles Peace Conference, assistant secretary of the treasury, and under secretary of state. Under later presidents he also was employed on diplomatic missions. He was a member of several League of Nations committees, serving on its financial committee from 1931 to 1937. In 1932 President Hoover appointed him a delegate to the General Disarmament Conference at Geneva. Davis was a United States delegate to the London Naval Conference in 1935, in 1937 to the International Sugar Conference in London, and in the same year to the Nine Power Parley held in Brussels to formulate plans for stopping Japanese aggression against China. The parley was frustrated by Britain's refusal to take any

action against Japan, in accord with her policy of placating the Axis powers and ignoring similar aggressions by them in Europe and Africa. Mr. Davis became chairman of the American Red Cross in 1938.

DAVIS, Oscar King, American journalist: b. Baldwinsville, N. Y., Jan. 13, 1866, d. June 3, 1932. He was graduated at Colgate University 1888, from which he received the honorary degree of Litt.D. in 1914. During the Spanish-American War and the Philippine insurrection, and in China during the Boxer Campaign he was special correspondent of the *New York Sun* and *Harper's Weekly* at Manila. He was special correspondent of the *New York Herald* with the First Japanese Army 1904. He was Washington correspondent of the *New York Times* and the *Philadelphia Public Ledger* 1907-12, and became secretary of the Progressive National Committee in 1912. He was special correspondent of the *Chicago Tribune* in the Far East 1915-16; secretary National Foreign Trade Council after 1917.

DAVIS, Rebecca Blaine Harding, American writer and novelist: b. Washington, Pa., June 24, 1831; d. Sept. 29, 1910. She contributed many short stories and sketches to periodicals, and also wrote several novels, including *Life in the Iron Mills* (1861); *A Story of Today* (1861), published later under the title *Margaret Howth*; and *A Law Unto Herself* (1878). She was the first United States writer to introduce the labor question into fiction.

DAVIS, Reuben, American lawyer: b. Tullahoma, Tenn., Jan. 18, 1813; d. Huntsville, Tenn., Oct. 14, 1890. He was educated in his native place, studied medicine and after a few years' practice abandoned that profession for the study of law. He removed to Aberdeen, Miss. He served in the war with Mexico as colonel of the second regiment of Mississippi volunteers. He was a member of the state House of Representatives from 1855 to 1857 and was elected to Congress from Mississippi, serving from 1857 to 1861, when he retired and entered the Confederate Army as brigadier general commanding a brigade of Mississippi militia in Kentucky. After the close of the Civil War he resumed his law practice. He published *Recollections of Mississippi* (Boston 1889).

DAVIS, Richard Harding, American journalist and popular novelist: b. Philadelphia, Pa., '864; d. Mount Kisco, N. Y., April 11, 1916. His mother was Rebecca Harding Davis. He was educated at Lehigh and at Johns Hopkins; became a reporter on the *Philadelphia Record* in 1887; and in 1888 went to New York where his striking stories of local life, first printed in the *New York Evening Sun*, brought him into prominence. For a short period he was managing editor of *Harper's Weekly* (1890). From that time on he roved wherever he pleased or where editors sent him. His first war correspondence came out of the conflict between Greece and Turkey. Later he "covered" all the important wars for various newspapers and magazines—the Spanish-American, South African and Russo-Japanese wars. In 1914 he was correspondent for the *New York Tribune* in Mexico during the seizure of Vera Cruz. In August 1914 Mr. Davis was captured by the

Germans and narrowly escaped being shot for a spy. His last assignment was with the French and British armies in the retreat from Serbia, and the hardships of his correspondent's life are believed to have brought on the attack of angina pectoris which caused his death. A high type of fearless American journalism is exhibited in his travel sketches and war correspondence. While not deeply analytical, his stories and novels are full of action and the characters impress by independence and exuberant vitality. Among his books are *Gallagher and Other Stories* (1891); *Stories for Boys* (1891); *Van Bibber and Others* (1892); *Our English Cousins* (1894); *About Paris* (1895); *The Rulers of the Mediterranean* (1894); *The Exiles* (1895); *Three Gringos in Venezuela and Central America* (1896).

DAVIS, Thomas Edward, American editor: b. Bedford, Va., Sept. 25, 1835; d. Feb. 20, 1917. He was graduated (1858) at the University of Virginia, studied medicine and law but did not practice; in May 1861 joined the Confederate Army, became adjutant of the 21st Virginia Cavalry and was promoted major and assistant adjutant general. In 1876 at Houston, Texas, he founded the *Telegram*. In 1879 he joined the staff of the *New Orleans Picayune*, of which journal he became editor in 1884, remaining in this relation till the sale and consolidation with the *Times-Democrat* in 1914.

DAVIS, Varina Anne Jefferson, American novelist: b. Richmond, Va., June 27, 1864; d. Narragansett Pier, R. I., Sept. 18, 1898. She was called the Daughter of the Confederacy, her father being Jefferson Davis, the president of the Confederate States. Her education was obtained partly in the United States and partly in Germany and France. She wrote *The Veiled Doctor*, a novel, and *A Romance of Summer Seas*.

DAVIS, Varina Howell Jefferson, American writer: b. Vicksburg, Miss., May 7, 1826; d. New York, N. Y., Oct. 16, 1906. She was the second wife of Jefferson Davis (q.v.). She was her husband's amanuensis when he wrote his *Decline and Fall of the Confederate Government* and was the author of *Jefferson Davis: a Memoir, by His Wife* (1890).

DAVIS, William Morris, American geologist and geographer: b. Philadelphia, Pa., Feb. 12, 1850. He was educated at Harvard University. He rendered valuable service as assistant astronomer in the Argentine National Observatory at Cordoba from 1870 to 1873. He taught astronomy and geology at Harvard from 1878; in 1890 became professor of physical geography there, and in 1899 was made Sturgis-Hooper professor of geology, continuing in this relation till 1912, when he became professor emeritus. He attained high rank in physiography by his lectures and writings on the development of the physical features of the earth and in 1911 was elected president of the Geological Society of America. He received numerous honorary degrees, became a member of many learned societies and scientific bodies, and was made a chevalier of the Legion of Honor in 1912. His many valuable treatises were published in the *American Journal of Science* and other periodicals.

DAVIS STRAIT, a strait on the west coast

of Greenland, which connects Baffin Bay with the Atlantic Ocean. It was discovered in 1585 by John Davis (qv). It measures from 200 to 500 miles across. In 1888 the identity between Ginnunga Gap, referred to in the sagas, and the present Davis Strait, was demonstrated.

DAVISON, Emily Wilding, militant suffragist. A lady of good Northumbrian family and a B.A. of London University, she had been imprisoned for militancy on several occasions and repeatedly resorted to the hunger strike. On Derby Day, June 3, 1913, as the horses swept round Tattenham Corner at Epsom, she dashed out in front of them, bringing down Anmer, the king's horse, and its jockey to the ground, and herself sustaining injuries to which she succumbed on June 8.

DAVIT. (1) A beam projecting from a ship's bow, for the attachment of the tackle whereby the anchor fluke is lifted without dragging against the side of the vessel. The operation is nautically called "fishing the anchor." (2) One of a pair of cranes on the gunwale of a ship, from which are suspended the quarter or other borts. The boat tackles are attached to rings in the bow and stern of the boat respectively and the fall is belayed on deck. When the boat is lowered the hooks of the fall-blocks are cast off simultaneously, or great danger results when the ship is under way.

DAVITT, Michael, Irish Nationalist politician and journalist: b. Straid, County Mayo, March 25, 1846; d. Dublin, May 31, 1906. His parents, peasant farmers, were evicted from their farm in 1851 and migrated to Lancashire, where at the age of 10, Michael began work in a cotton mill at Haslingden. Here in 1857 he lost his right arm by a machinery accident and secured employment in a printing office where he also managed to educate himself. He joined the Fenian brotherhood in 1867 and in 1870 was sentenced to 15 years' penal servitude for treason-felony in arranging for sending firearms into Ireland. He was released on a ticket of leave in 1877 and went on a lecture tour in the United States. Returning to Ireland he founded at his birthplace, Oct. 21, 1879, the Land League, which spread all over Ireland. He was again in America in 1880, organizing an American branch of the Land League, and on his return to Ireland was imprisoned under the Coercion Act. He was released in 1882. While in prison he had been chosen parliamentary representative for Meath, but being a convict was disqualified. He was one of the respondents before the Parnell Commission 1888-1890, and conducted his own defense in a five-day speech. He became an anti-Parnellite in 1890 and in 1892 was elected member of Parliament for North Meath, but was unseated on petition. He was next returned for Northeast Cork but had to vacate his seat through bankruptcy, caused by the costs in the North Meath petition. Elected for West Mayo in 1895 he resigned in 1899. He contributed hundreds of articles to journals in Ireland, England and America and published among other books *Leaves from a Prison Diary* (1884); *Defense of the Land League* (1891); *The Boer Fight for Freedom* (1902); *Within the Pale* (1903).

DAVOS, dā'vōs, a valley and district of Switzerland in the canton of Grisons, lying at a

considerable elevation among the Alps and now a favorite place of residence both in summer and winter for people troubled with tuberculosis. The valley is about 10 miles long, shut in by mountains from 6,000 to 10,000 feet high and exhibiting many picturesque features.

DAVOUT, dā'voo', **Louis Nicholas**, duke of Auerstadt, prince of Eckmühl and marshal of France: b. Annoux, Yonne, May 10, 1770, d. Paris, June 1, 1823. He was educated at Brienne and entered the army as sublieutenant of cavalry in 1788. On the outbreak of the Revolution he embraced its principles. He was *chef de bataillon* in the campaign of 1792, was promoted general of brigade, but was removed because of his being of noble birth. He served on the Rhine in 1794-1797, and accompanied Desaix to Egypt in 1798. His skillful handling of his troops at Aboukir came under the attention of Napoleon, and, in 1800 he was made general of division and commanded the cavalry in the Marengo campaign. He was next appointed commander of the consular guard and marshal of France in 1804, soon after Napoleon became emperor. He distinguished himself in all of the succeeding campaigns as commander of the Third Army Corps. At Austerlitz his corps bore the brunt of the fighting, in the Jena campaign with a single corps Davout won the great victory of Auerstadt against the main Prussian Army. His fame was enhanced at Eylau and Friedland. He was appointed governor general of the grand duchy of Warsaw after the Treaty of Tilsit in 1807, and in 1808 Napoleon made him duke of Auerstadt. He again distinguished himself in the actions leading to the brilliant victory of Eckmühl, and also in the Battle of Wagram. He was made prince of Eckmühl in 1810. He helped organize the gigantic army which invaded Russia in 1812. In this campaign he won the victory of Mohiler and was wounded at Borodino. He was placed in command of the Hamburg military district in 1813, defended that city for several months, only surrendering on the direct order of Louis XVIII after the fall of Napoleon in 1814. His character and methods were often regarded as cruel and rapacious, but he doubtless acted on the instructions of Napoleon; being a rigid disciplinarian he gave the same precise obedience to superior orders which he exacted from his own subordinates. His military talents were of the highest, and later judgment has regarded him as perhaps the ablest of all Napoleon's marshals. Although at the first restoration he made his submission, he maintained his hostility to the Bourbons and during the Hundred Days acted as minister of war, showing extraordinary ability in organizing troops and procuring army supplies. After Waterloo he directed the hopeless defense of Paris, and was deprived of his estates and titles after the restoration. He protested against the proscription of 1815 and when some of his subordinate generals were included, Davout demanded to be held responsible for their acts, as executed under his orders. His rank was restored to him in 1817 and he became a member of the Chamber of Peers in 1819. Consult Blocqueville, *Le maréchal Davout* (Paris 1879-80); *Correspondance du maréchal Davout* (ed. Mazade, 4 vols., Paris 1885); Chenier, *Davout, duc d'Auerstadt* (ib. 1866); Holzhausen, *Davout in Hamburg*

(Mülheim an der Ruhr 1892); Vigier, *Davout, Maréchal de l'Empire*, 2 vols. (Paris 1898).

DAVY, SIR Humphry, English chemist: b. Penzance, Cornwall, Dec. 17, 1778; d. Geneva, Switzerland, May 29, 1829. A taste for chemistry, which he displayed in some experiments on the air contained in seaweed, attracted the attention of Davies Gilbert (Giddy), president of the Royal Society, and Dr. Thomas Beddoes, and the latter offered him the place of assistant in his laboratory. Here Davy discovered the respirability and exhilarating effect of nitrous oxide. He published the results of his experiments, under the title of *Researches, Chemical and Philosophical* (1799). This work immediately secured for him the place of professor of chemistry in the Royal Institution, at the age of 22. His lectures were attended by crowded and brilliant audiences, who were attracted by the novelty and variety of his experiments, the eloquence of his discourses, and the clearness of his exposition. His discoveries with the galvanic battery, his decomposition of the earths and alkalies and ascertaining of their metallic bases, his demonstration of the true nature of oxymuriatic acid, and his discovery of chlorine as an element, obtained him a European reputation; and in 1808 he received the Napoleon prize of the French Institute. In 1812 he was knighted. In 1813 appeared his valuable *Elements of Agricultural Chemistry*. The numerous accidents arising from fire damp in mines led him to enter upon a series of experiments on the nature of this explosive gas, the result of which was the invention with which his name will always be associated, the safety lamp (1815). In 1818 he was created a baronet. In 1820 he succeeded Sir Joseph Banks as president of the Royal Society. He wrote *Bakerian Lectures* (1807-1811); *Elements of Chemical Philosophy* (1812); *On the Safety-lamp* (1818); *Salmonia, or Days of Fly Fishing* (1827); *Consolations in Travel* (1830). See also **LAMP—Safety Lamps**.

Consult his *Life* by Paris, Dr. J. A. (1831); his *Memoirs*, edited by his brother, John Davy, 2 vols. (London 1836); *Fragmentary Remains, Literary and Scientific* (London 1858), and Gregory, J. C. *The Scientific Achievements of Sir Humphry Davy* (London 1930).

DAVY JONES, a sailor's familiar name for a malignant spirit of the sea or the sea devil generally. The common phrase "Davy Jones's locker" is applied to the ocean as the grave of men drowned at sea. A very dubious explanation of the name makes it compounded from Duffy, a West Indian Negro spirit name, and the scriptural prophet Jonah, in jocular allusion to his somewhat unusual adventure.

DAVY LAMP, the safety lamp invented by Sir Humphry Davy (1816), in which a wire gauze envelope covers the flame chamber and prevents the passage of flame outward to the explosive atmosphere of the mine, while it allows circulation of air. See also **LAMP—Safety Lamps**.

DAW. See **JACKDAW**.

DAWES, dôz, Charles Gates, American statesman: b. Marietta, Ohio, Aug. 27, 1865; d. Evanston, Ill., April 23, 1951. One of the most distinguished Americans of his time, he gained international acclaim as the author of the Dawes

plan, and was vice president of the United States under Calvin Coolidge. Graduated from Marietta College, he attended the Cincinnati Law School (LL.B. 1886), was admitted to the Nebraska bar in 1886, and practiced law at Lincoln, Nebr., from 1887 to 1894. He then went into the manufactured gas business, becoming president of the LaCrosse (Wis.) Gas Light Company and of the Northwestern Gas Light and Coke Company of Evanston, Ill.

Entering politics in 1896, Dawes managed the Illinois campaign for William McKinley and was elected to the executive committee of the Republican National Committee. Appointed subsequently by McKinley to the position of comptroller of the currency (1897-1902), he instituted banking reforms. After his resignation he organized the Central Trust Company of Illinois (later the Central Republic Bank and Trust Company) at Chicago, of which he was president (1902-1921) and board chairman (1921-1925).

During World War I, Dawes was commissioned a major, went to France in July 1917 as a lieutenant colonel, and by October 1918 had won promotion to brigadier general.

In 1919 Dawes resigned from the army and returned to the United States where he successfully fought for the installation of a modern national budget. In 1921 he was appointed by President Warren Harding as the country's first director of the budget. In December 1923 he was named chairman of the Expert Commission on German Finances and Reparations which in April 1924 submitted to the Reparations Commission a detailed plan for the reorganization of the German fiscal system through obtaining an 800 million dollar loan from abroad, raising 11 billion gold marks by mortgaging the railway system of Germany, and obtaining another 5 billion gold marks as a mortgage on German industries. This plan, which became known as the Dawes plan, was put into effect on Sept. 1, 1924, and won its author the Nobel Peace Prize, which he shared with Sir Austen Chamberlain in 1925. Meanwhile, in June 1924, he was nominated for vice president on the Republican ticket with President Calvin Coolidge and was victorious in the election that followed. He declined to run for re-election.

From 1929 to 1932 Dawes served as ambassador to Great Britain, and in 1930 he was named a delegate to the London Naval Conference. In 1932 he was appointed by President Herbert Hoover as chairman of the newly established Reconstruction Finance Corporation. He resigned this post on June 6, 1932, to establish at Chicago the City National Bank and Trust Company of which he was board chairman until his death.

Dawes wrote *The Banking System of the United States* (1892); *Essays and Speeches* (1915); *A Journal of the Great War* (1921); *The First Year of the Budget of the United States* (1923); *Notes as Vice-President* (1935); *How Long Prosperity?* (1937); *A Journal of Reparations* (1939); and *Journal as Ambassador to Great Britain* (1939).

DAWES PLAN. See **DAWES, CHARLES GATES**.

DAWKINS, SIR William Boyd, English geologist: b. Buttington, near Welshpool, Mont-

gomeryshire, Wales, Dec. 26, 1837; d. Bowdon, Cheshire, England, Jan. 15, 1929. After graduating from Jesus College, Oxford, in 1860, he became a member of the Geological Survey of Great Britain (1861-1869), curator of the Manchester Museum (1870-1890) and professor of geology and paleontology at Owens College (now Victoria University), Manchester (1872-1908). He was employed by the Channel Tunnel Committee in 1882 to make a survey of the English and French coasts, and the next year he selected the location for a tunnel under the Humber. He delivered the Lowell lectures in Boston in 1880. He was knighted in 1919. His extensive researches on fossil mammals and on prehistoric man were recorded in his books: *Cave Hunting* . . . (1874); *Early Man in Britain* . . . (1880); and *British Pleistocene Mammalia*, 6 vols. (1866-1887).

DAWLEY, dô'li, Thomas Robinson, Jr., American journalist: b. New York, N. Y., April 18, 1862; d. there, June 2, 1930. After one year in a Brooklyn high school he worked his passage to Liverpool and London, and after a brief return to New York spent 10 years in Central America, the West Indies, Spain, and France. In 1896 when revolution broke out in Cuba, *Harper's Weekly* sent him there as its correspondent. He sent stories from both insurgent and Spanish camps and was deported by Gen. Valeriano Weyler y Nicolau, the Spanish governor. A year later he returned and was with the Cuban Army commanded by Gen. José Miguel Gomez when the Spanish-American War began. He then became a volunteer aide on the staff of Gen. Nelson A. Miles. Following the capture of Santiago he published an American daily newspaper, *The Times of Cuba*, until it was taken over by the Cuban authorities. Dawley was sent to Spain by the *Century* magazine and was special commissioner for the *Outlook* at the Pan-American Congress in Mexico City in 1901. He prepared a special report for President Theodore Roosevelt on conditions in the Dominican Republic in 1904. He subsequently participated in the Guatemalan revolution of 1920 which overthrew the government of President Manuel Estrada Cabrera.

DAWN, The, generally regarded as the greatest symbolic drama of Émile Verhaeren. A more correct English title would be *The Dawns*, from the original French *Les Aubes*. It differs in content from the plays of Verhaeren's Belgian countryman Maurice Maeterlinck in that it concerns itself directly with social problems and the social revolution of the future, rather than with the psychic readjustment of the individual. "The Dawns" here prophetically foreshadowed are the beginnings of justice between class and class, the triumph of great cities, and the coming of peace through renunciation of victory by a people that has conquered its past and its traditional leaders. The drama announces that the time has come to found new religions and proclaim new doctrines. It differs from Maeterlinck also in construction and style; for whereas Maeterlinck allures with feminine charm and an insinuating grace, Verhaeren attacks his theme with abrupt vigor and irresistible *élan* that bursts into passages of magnificent poetry. He would compel rather than win his audience. Indeed, it is in these longer impassioned and flaring outbursts that the meaning of the play, as well as its poetic value, is to be sought. The drama proper is not well articu-

lated, and into it are wound so many strands of meaning that at points it breaks down. For this reason, though published in 1898, it has been produced but once, and then privately. The play has been admirably translated into English by Arthur Symons.

CHRISTIAN GAUSS.

DAWSON, dô's'n, Coningsby (William), Anglo-American author: b. High Wycombe, Buckinghamshire, England, Feb. 26, 1883. Upon graduation from Merton College, Oxford, in 1905, he went to America where he wrote for English newspapers and American magazines. A prolific writer, most of his works are light novels. Some of the well-known writings are *The Worker and Other Poems* (1906); *The Garden Without Walls* (1913); *Out to Win* (1918); *The Vanishing Point* (1922); *When Is Always?* (1927); *The Moon Through Glass* (1934); *Inspiration Valley* (1936); and *Tell Us About the Night* (1941).

DAWSON, Geoffrey, English journalist b. Skipton, Yorkshire, England, 1874; d. London, Nov. 7, 1944. After distinguishing himself at Eton and at Oxford, he joined the South African Department of the Foreign Office in 1898, at the beginning of the Boer War, and from 1905 to 1910 served as secretary to Viscount Alfred Milner, governor general of South Africa. When Lord Milner retired, Dawson became editor of the *Johannesburg Star*, and correspondent for *The Times*, London, in South Africa. In 1910 he was called to London to become assistant editor of *The Times* and two years later became editor. After piloting it through World War I he resigned in 1919 following policy clashes with Lord Northcliffe, the chief stockholder. When Northcliffe died in 1922, *The Times* passed into the hands of John Jacob Astor and Dawson was recalled to replace Wickham Steed as editor, resigning again in 1941. Born Geoffrey Robinson, he had his name changed to Dawson in 1917 by royal license.

DAWSON, George Mercer, Canadian geologist: b. Pictou, Nova Scotia, Canada, Aug. 1, 1849; d. Ottawa, March 2, 1901. He was the son of Sir John W. Dawson (q.v.) and was educated at McGill University, Montreal, and at the Royal School of Mines in London. He joined the Geological Survey of Canada in 1875, was its director from 1895 to 1901, and was largely responsible for the mapping of the Canadian Northwest. Dawson, the capital of Yukon Territory, was named for him.

DAWSON, Henry, English landscape painter: b. Hull, England, April 3, 1811; d. Chiswick, Dec. 13, 1878. He struggled many years before his abilities were recognized and his pictures began to bring high prices. Among them are *Wooden Walls of Old England*; *Houses of Parliament*; *London from Greenwich Hill*; and *The Pool Below London Bridge*.

DAWSON, Sir John William, Canadian geologist: b. Pictou, Nova Scotia, Canada, Oct. 13, 1820; d. Montreal, Nov. 19, 1899. After graduating at Edinburgh University he returned to Nova Scotia in 1842 as a member of Sir Charles Lyell's expedition which examined the geology of the Maritime provinces. In 1850 he became superintendent of education for Nova Scotia, and

was in 1855 appointed principal and professor of geology in McGill University, Montreal, a post he retained until his retirement in 1893. He became a member of the Royal Society (London) in 1862, first president of the Royal Society of Canada in 1882, was knighted in 1884, was president of the British Association in 1886, and of the American Association for the Advancement of Science in 1892. Among the best known of his numerous published works are *Acadian Geology* (1855; 4th ed., 1891); *The Story of the Earth and Man* (1872); *The Chain of Life in Geological Time* (1881); *The Ice Age in Canada* (1894).

DAWSON, Miles Menander, American lawyer, actuary and author: b. Viroqua, Wis., May 13, 1863; d. Orlando, Fla., March 27, 1942. He was educated at Kentucky (now Transylvania) University and at New York University Law School, and maintained an office in New York City where he engaged in practice as a consulting actuary and insurance lawyer. He was adviser to the United States War Risk Insurance Bureau 1917-1921, and served the government in various other capacities. He published a number of works on life insurance, among them *Elements of Life Insurance* (1892, 3rd ed., 1911); *Principles of Insurance Legislation* (1896); *Development of Insurance Mathematics* (1901).

DAWSON, Samuel Edward, Canadian publisher: b. Halifax, June 1, 1833, d. Westmount, Montreal, Feb. 9, 1916. He was educated at McCulloch's school, Halifax, and completed his education in Montreal where he came with his father, the Rev. Benjamin Dawson, in 1847, and where he later became prominent in the book publishing field. He was king's printer of Canada 1891-1909, and president of the Royal Society of Canada, 1907. His book, *The Saint Lawrence Basin and its Border Lands* (1905), is an important contribution to the history of early exploration in Canada.

DAWSON, William, English lay preacher: b. Garforth, Yorkshire, March 30, 1773; d. Colne, Lancashire, July 4, 1841. Though a practical farmer, he became an accredited Wesleyan Methodist lay preacher and was widely known in England for his eloquence. His life was written and his letters edited by James Everett (1842).

DAWSON, William Harbutt, English publicist: b. Skipton, Yorkshire, July 27, 1860; d. March 7, 1948. He was educated at Skipton School, Ermistead, and at Berlin University. He is best known for his books interpreting German thought and life to English readers and his studies of German economic and industrial conditions.

DAWSON, William James, English clergyman and author: b. Towchester, Northamptonshire, Nov. 21, 1854; d. Nelson, British Columbia, Canada, Aug. 23, 1928. He was educated at Didsbury College, Manchester, and entered the Wesleyan ministry in 1875. In 1892 he resigned and entered the Congregational ministry. He lectured extensively in the United States in 1905, and in 1912 became pastor of the First Presbyterian Church in Newark, N. J., of which

he was made pastor emeritus in 1925. He wrote both prose and poetry. Among his published works were *Book of Courage* (1911); *The Man Christ Jesus* (1925); *Autobiography of a Mind* (1925).

DAWSON, city, Georgia, seat of Terrell County, is located 22 miles northwest of Albany on the Central of Georgia and Seaboard Airline railroads. Altitude 355 feet. It is a major peanut market, and manufactures peanut products, cottonseed oil, and lumber.

First settled in 1856, it was incorporated in 1872, and is governed by a mayor and board of aldermen. Pop. (1950) 4,411.

DAWSON, dō's'n, city, Yukon Territory, Canada, distributing center of the Klondike gold and coal mining area, is situated in mountainous country at an elevation of 1,400 feet, on the right bank of the Yukon River, at the juncture of the Klondike River with the Yukon. It is 1,473 miles north of Vancouver, British Columbia, and 50 miles east of the Alaska boundary. It was capital of the Territory until March 14, 1951, when the Canadian Parliament authorized removal of the administrative offices to Whitehorse. Communication is maintained from Whitehorse, 460 miles distant, by Canadian Pacific tri-weekly air service and in summer by steamship via the Yukon and Lewes rivers. Formerly called Dawson City, it was named after George M. Dawson, Canadian geologist, who was in charge of the Yukon expedition for the Canadian government in 1887. The average summer temperature is 50° to 60°F; the mean January temperature is -21°F. Gardens yield excellent vegetables during the short but pleasant summers. The city has schools, a library, hospital, airfield, radio and weather station, and a Royal Canadian Mounted Police post.

The discovery of placer gold on Bonanza Creek in August 1896 started a rush—the "Trail of Ninety-eight"—which established Dawson as a typical frontier mining town, recalling the rushes of half-a-century before to the Sacramento, the Fraser and the Cariboo, though with less lawlessness owing to the vigilance of the Northwest Mounted Police. The scenes and characters of the time are the theme of Robert W. Service's *Songs of a Sourdough*. Within a short time Dawson had reached a population of 20,000. After 1905 it declined rapidly in population. In 1900 at the peak of production, when mechanical dredging and sluicing were replacing the primitive operations of the early miners, over 32 million dollars in gold was shipped from the camp. The output gradually fell off, and by 1920 some large operators had withdrawn. Altogether, however, gold amounting to about 215 million dollars has been recovered up to 1950, the yield that year being \$2,259,000. Cold water thawing of the ground to be dredged has superseded steam, and advance drilling provides an accurate forecast of recoverable gold. Pop. (1951) 773.

DAWSON CREEK, village, Canada, in the district of Cariboo, British Columbia, near the Alberta border. It is situated on Dawson Creek, 170 miles northeast of Prince George and 300 miles northwest of Edmonton, and is the southern terminus of the newer part of the Alaska Highway. It is connected with Edmonton by

highway and the Northern Alberta Railroad. It is in a lumbering and fur trading area, with mixed farming and stockraising, and has grain elevators, planing mills, and a small hospital. Pop. (1952 est.) 3,589.

DAX, daks, a town in department of Landes, southwestern France, on the left bank of the Adour 32 miles northeast of Bayonne by rail. It consists of the town proper, surrounded by old ramparts partly Roman, and of a suburb called Sablar, on the opposite side of the river and communicating with it by a bridge. The principal edifices are the high church, once a cathedral, the bishops palace, now occupied as public offices, the communal college, and a handsome thermal establishment. There are various ancient Roman remains. Its chief attraction is its warm sulphur springs, which have temperatures varying from 86° to 166° F. Its old name was Aquae Tarbellicae. Pop. (1946) 14,113.

DAY, Arthur Louis, American physicist: b. Brookfield, Mass., Oct. 30, 1869. He was graduated at Yale in 1892, and was instructor in physics there in 1894-1897. He was a member of the scientific staff of the Physikalisch-Technische Reichsanstalt at Charlottenburg, Germany, 1897-1900, and physical geologist of the United States Geological Survey 1900-1906, and in the latter year was appointed director of the geophysical laboratory of the Carnegie Institution at Washington. He is member of several learned societies, and has written many papers upon physical and geophysical investigations at high temperatures.

DAY, Benjamin Franklin, American naval officer: b. Plymouth, Ohio, Jan. 16, 1841; d. July 3, 1933. He was graduated at the United States Naval Academy in 1862. During the Civil War he served with the West Gulf (1862-1864) and North Atlantic (1864-1865) blockading squadrons, and attained the rank of lieutenant commander in 1866. In 1876 he became commander, in 1891 captain, in 1899 rear admiral, and was retired from the service in 1900. From 1897 to 1900 he was a member of the Naval Examining and Retiring boards.

DAY, Edmund Ezra, American educator: b. Manchester, N. H., Dec. 7, 1883. Graduated from Dartmouth in 1905 (M.A. 1906). In 1907-1910 he was instructor in economics there, spending the years 1908-1909 at Harvard (Ph.D. there 1909). From 1910 to 1923 he was successively instructor, assistant professor, and professor of economics at Harvard. In 1923-1927 he was professor of economics at the University of Michigan. There he organized and became first dean of the School of Business Administration. In 1927-1928 he was associated with the Laura Spelman Rockefeller Memorial in New York City and from 1928 served as director for social sciences of the Rockefeller Foundation. In addition from 1933 he was director for social sciences and general education in the General Education Board. In 1937, Dr. Day was chosen president of Cornell University in succession to Dr. Livingston Farrand, who retired June 30, 1937.

DAY, Holman Francis, American journalist and author: b. Vassalboro, Me., Nov. 6, 1865;

d. Mill Valley, Calif., Feb. 19, 1935. He was graduated at Colby College in 1887 and after 1888 was editorially connected with various Maine journals. He published 3 volumes of popular verse, *Up in Maine* (1900); *Pine Tree Ballads* (1902); *Kin o' Ktaadn* (1904); also of novels *Squire Phin* (1905), dramatized as *The Circus Man*, produced Chicago (1909); *The Rainy Day Railroad War* (1906); *The Eagle Badge* (1907); *King Spruce* (1908); *The Ramrodders* (1909); *The Skipper and the Skipped* (1911); *The Red Lane* (1912); *The Landloper* (1915); *Blow the Man Down* (1916); *John Lang* (1926); *Star-wagons* (1928); *Along Came Ruth*, a play, produced (1914).

DAY, James Roscoe, American educator: b. Whitneyville, Me., 1845; d. March 13, 1923. He studied at Bowdoin and was ordained a minister of the Methodist Episcopal Church in 1872. He was pastor at Bath, Me., Portland, Me., Boston, and New York. From 1893 to 1922 he was chancellor of Syracuse University, emeritus thereafter. He was elected bishop in 1904, but declined the honor. He wrote many magazine articles and sermons and published in book form *The Raid on Prosperity* (1907).

DAY, Jeremiah, American educator: b. New Preston, Conn., Aug. 3, 1773; d. New Haven, Conn., Aug. 22, 1867. He was graduated at Yale 1795. Having early made choice of the profession of theology, while acting as tutor he began to preach as a candidate for the ministry, but before taking charge of any parish was in 1801 elected to the professorship of mathematics in Yale College. In 1817 he became president of the college, continuing in that position till his resignation in 1846. He published *An Introduction to Algebra* (1814); *Navigation and Surveying* (1817); and other works.

DAY, John, English dramatist: b. Cawston, Norfolk, 1574; d. ?1640. John Day is mentioned in Henslowe's *Diary* in 1598 as an active playwright. But few of his earlier works have come down to us save *The Blind Beggar of Bethnal Green*. Day collaborated freely with contemporary writers, as Chettle and Dekker. Ben Jonson in his conversations with Drummond of Hawthornden grouped him with some other admirable gentlemen and authors as a rogue and a base fellow. His best works that have reached us are a graceful comedy, *Humour out of Breath*, and *The Parliament of Bees*, a kind of allegorical masque in which all the characters are bees. "The very air," says Charles Lamb, "seems replete with humming and buzzing melodies. Surely bees were never so be-rhymed before." An edition of Day's works was privately printed by A. H. Bullen in 1881. Algernon Swinburne wrote an enthusiastic study of this minor Elizabethan for the *Nineteenth Century* (October 1897). Consult Ward, *History of English Dramatic Literature* (London 1899) and the *Cambridge History of English Literature*.

DAY, Richard Edwin, American editor: b. West Granby, N. Y., April 27, 1852; d. Albany, N. Y., Dec. 14, 1936. He was graduated at Syracuse University 1877, engaged in teaching, then journalism, being associate editor of the *Syracuse Standard* for 18 years. After 1899 he edited State publications at Albany.

N. Y., 1904-1929 in state historian's office. His books include *Thor; a Drama* (1880); *Dante—a Sonnet Sequence and Other Poems* (1924); with Arthur Pound, a biography, *Sir William Johnson* (1930).

DAY, or DAYE, dā, Stephen, first printer in British colonies in America: b. England about 1594; d. Cambridge, Mass., Dec. 22, 1668. A locksmith by trade, in 1618 he married a baker's widow in Cambridge, England. With wife and three sons he sailed for Massachusetts in the summer of 1638 aboard the *John* of London, accompanying the Rev. Jesse Glover who had given him a two-year contract to operate a printing press which they brought with them. On the voyage to Boston Glover died, but his widow observed the terms of the contract and moving to Cambridge purchased a house for the Days near Harvard College. There on the present Holyoke Street the press commenced its printings, the first being the Freeman's Oath of the colony. Before 1649 when Samuel Green became the printer, 22 imprints are known to have been made, including 10 annual almanacs, five Harvard commencement broadsides, the Capital Laws (1642), and *The Book of General the Lawes and Liberties* (1648). Of the 22, only nine are known to be extant. The most famous of these early printings is the *Bay Psalm Book* (1640). After Mrs. Glover's marriage to the Rev. Henry Dunster, president of Harvard, in 1641, the press was removed to their house. Day acquired property, prospected for minerals, and was a promoter of ironworks. About 1655 he returned to Cambridge and resumed his trade of locksmith and gunsmith. His name is spelled *Day* in most contemporary documents and signatures; in a few, *Daye*.

DAY, Thomas, English author: b. London, June 22, 1748; d. Wargrave, Lancashire, Sept. 28, 1789. Educated at Oxford, he was called to the bar (1775), but never practiced. A man of highest moral principles, he was outspoken for the American Revolutionaries but strongly opposed slavery. A man of ample means, he lived frugally and devoted his wealth to helping the poor. His poems and most of his prose writings are forgotten, with the exception of his 3-volume *History of Sandford and Merton* (1783-1789), a boys' book of moral instruction which continued a favorite gift book in Great Britain, Canada and the United States for nearly a century after the author's death.

DAY, William Rufus, American jurist: b. Ravenna, Ohio, April 17, 1849; d. Mackinaw Island, Mich., July 9, 1923. A graduate of the University of Michigan in 1870 and its law school in 1872, he was admitted to the Ohio bar and began practicing at Canton. From 1886 he began his services on the bench. His friend President McKinley appointed him assistant secretary of state in 1897 and in April 1898, on the eve of the Spanish-American War, he succeeded John Sherman in the secretaryship. Later that year he resigned to become chairman of the United States Peace Commission. He was appointed a United States circuit judge in 1899 and in 1903 justice of the Supreme Court from which he resigned in 1922.

DAY, a word used in several different senses.

Its most ancient meaning is the period of light (natural day) as opposed to the period of darkness, and in this sense it is still commonly used. Its most usual application, however, is to the period of light and that of darkness together, but even in this sense days differ. The sidereal day is the time that elapses between two successive upper meridian transits or culminations (see **CULMINATION**) of any fixed star. In other words the time occupied by the Earth to revolve upon its axis with respect to the star. This day is 3 minutes and 56 seconds shorter than the mean solar day.

The apparent solar day is the time that elapses between two successive returns of the same terrestrial meridian to the Sun's center. This period varies in length and its average length gives us the mean solar or civil day. The 24 hours of the sidereal day are numbered from 1 to 24 while the civil day is usually divided into two portions of 12 hours each. The abbreviations A.M. and P.M. (the first signifying ante meridiem, Latin for forenoon, the latter post meridiem, afternoon) are requisite due to the division of the day into two 12-hour periods. In this respect numbering the hours from 1 to 24 consecutively has an advantage and in many countries has been introduced. This system is used in the United States Navy.

The Babylonians began the day at sunrise, the Greeks and Jews at sunset, the Egyptians and Romans at midnight as do most modern nations. Astronomers use a day of the same length as the civil but until 1925 made it begin at noon and numbered the hours up to 24. In 1925 it was agreed to shift back to midnight, though many individuals have refused to make the change, so there is considerable confusion.

If we take a day according to the second definition given above (sidereal day), its length is the same throughout the year (see **SIDEREAL TIME**). The solar day, due to the varying speed of the Earth in its orbit, and the obliquity of the ecliptic, differs in length on different dates, but this difference is uniform for every place on the Earth. However, the length of the natural day or period of daylight varies according to the distance of the place from the equator. (See **SUN-DIAL**.)

To derive mean solar time astronomers postulate a fictitious sun moving uniformly in the celestial equator and completing its annual circuit in the same time as the real Sun. The time marked by this fictitious sun is called mean solar time; when this sun is on the upper meridian it is mean noon; when the real Sun is on the upper meridian it is apparent noon. Four times a year these two kinds of solar time coincide. In the intervals the Sun is either too fast or too slow, and the difference is called the equation of time.

The daily apparent revolution of the Sun takes place in a slow spiral which, for a given day, approximates a circle parallel to the celestial equator. Owing to the inclination of the Earth's axis to the plane of its orbit in which lies the ecliptic, the declination circle in which the Sun appears to move is continually changing and therefore the celestial equator alone remains bisected by the horizon, which divides day from darkness as day begins when the Sun appears above the horizon. The days and nights at our equator are always equal, except for the effects of refraction which everywhere on the Earth, except in the polar regions, make the time that

the Sun is above the horizon 4 minutes longer, on an average, by causing sunrise to be hastened by 2 minutes and sunset to be retarded by 2 minutes. As for every place on the Earth the celestial equator is bisected by the horizon, at the equinoxes the Sun is visible 12 hours, except again in the polar regions.

As we approach the poles the inequality between the days and nights becomes continually greater, until at the poles themselves a day of six months is followed by a night equally long. At the solstices, when the Sun is farthest from the celestial equator, its greatest declination is $23\frac{1}{2}^\circ$ north or south and hence these are also the extreme latitudes on the Earth for which it can pass through their zeniths. When the Sun is above one of the tropics, which have latitudes of $23\frac{1}{2}^\circ$, all the polar circle in the same hemisphere will be within the illuminated zone, because every point of it will be within 90° of the Sun, while the other polar circle will be in the region of darkness, both for 24 consecutive hours. These arctic and antarctic circles therefore have one such day and night per year. From these circles to the poles the length of the longest day increases fast, and equally the length of the longest night. Despite the inequalities of the periods of light and darkness in the different parts of the Earth on different dates during a year, however, when 12 months have passed every place has had the Sun above the horizon for a total of six months and below for the same period, again not making allowance for the small effects of refraction which always act to increase the time it is above the horizon. If the Earth had no atmosphere, the times would be exactly equal.

CHARLES P. OLIVIER.

DAY-BLINDNESS, or **HEMERALOPIA**. See **VISION**, **DEFECTS OF**.

DAY LILY, the popular name for a genus of lilies (*Heimerocallis*), natives of temperate Asia and chiefly of eastern Europe, grown in gardens. They have long radical leaves, and a branched few-flowered scape, with handsome large blossoms, the segments of which are united into a tube. The flowers are found in meadows and along streams throughout the Atlantic seacoast from New Brunswick to Virginia, and west to Ontario and Tennessee. The name of the genus is from Greek signifying "beautiful for a day." In Europe these plants are sometimes cultivated as fodder for cattle. A Japanese plant, *Funkia subcordata*, is also known as the day lily.

DAY NURSERY, day care center, child care center, nursery school, are names used interchangeably in the United States for a specialized service for children who require daytime care away from their own homes. Families turn to the day care agency when there is need for the mother to work, when the father has sole responsibility for care of the child, when physical or emotional incapacity of either parent makes supplemental care necessary for the child, when inadequate housing creates living conditions adversely affecting the child, and when the child has special need for a group living experience.

The day care agency does not substitute for the home; it is a means of assisting parents to fulfill their parental responsibilities for the child. The Midcentury White House Conference on Children and Youth pointed out the special values

in day care centers and nursery schools as means of preventing family breakdown, since the children receiving this service are able to live as full members of their family while receiving the kind of care they need during the hours they must be apart from their parents.

The kind of care a child receives from birth to six years has far-reaching effects on his personality development, as well as on his physical well-being. The modern day care agency is characterized by a broader and deeper knowledge of children, by an awareness of the interdependence of the child's emotional, physical and intellectual life, and of the great importance of the interrelationships between the child, his family, and the day care service. The day care program provides a group living experience for children under the supervision of teachers who have special training in child development and understand how to plan a program that meets the needs of young children, and that provides for emotional security, learning opportunities, and social experiences. Parents are helped by the social worker to understand their children better, to make plans that will minimize the effects of the daily separation from the mother for the young child, and to know and use other community resources when needed. Staff of the day care center includes professionally trained personnel from the fields of social work, education and health.

Although not all institutions offering day care for children now provide such staff and program, this is the goal of national organizations and agencies such as the United States Children's Bureau, the Child Welfare League of America, the National Association of Nursery Education and the Association for Childhood Education International, which have special concern for group day care programs for young children and which have established standards for their operation.

The majority of children now receiving group day care are from two to six years of age, but many agencies provide before and after-school care for children up to twelve years of age. Children under two are not cared for in any program meeting minimum national standards, and there is a trend toward setting the lower age limit at three. Children under three who need daytime care out of their homes can be emotionally better nurtured in a family setting, and programs of foster family day care are being developed to meet this need.

DOROTHY H. BEERS,
Day Care Consultant, Child Welfare League of America.

DAY OF ATONEMENT. See **ATONEMENT**.

DAY OF SECTIONS, in French history, 13th Vendémiaire IV (Oct. 5, 1795), when the National Guard attacked the Convention in the Tuileries. The forces of the government, under command of Napoleon, disarmed the regiments in the different sections, the first clash occurring in the Rue Saint-Honoré.

DAY OF THE DEAD, in the belief of certain Indian tribes of Latin America, is that day in each year when the dead are thought to revisit the earth. See **MYTHOLOGY—Growth of Myths**.

DAY OF THE LORD. Sometimes called the Day of Jehovah, or Day of Yahweh. A term

originating in the Old Testament eschatology of the 8th century B.C. The day of the Lord was to come when Jehovah would interfere in the affairs of Israel and deliver them from their misery and their foes. Hence the Day of the Lord is always spoken of as a day of judgment, not as an end, but in order that salvation may come. The judgment may be administered by some distant nation and would be accompanied by the terrors of the Lord. The prophets regarded the day as near at hand. While the day was primarily a day of judgment on Israel, yet it was to include all nations.

DAYE, Stephen. See DAY or DAYE, STEPHEN.

DAYFLY, a name sometimes used for the well-known Mayfly. A neuropterous insect of the family of Ephemeridae. The aquatic infant stages of larva and pupa are unusually long, often extending to 10 months; but the adult period is short, and is passed without taking food, and covers only a few hours, never more than a day. The mouth is atrophied in the adult, which passes through an immature winged stage known as the subimago. The body ends in two or three long thin tails. The membranous front wings are much bigger than the hind wings. In the early summer mayflies abound in great numbers about northern lakes and rivers, furnishing food for other insects, and for crustaceans and fish.

DAYLIGHT SAVING. A movement originated in England by William Willett (1857-1915), in 1907 by the publication of a booklet entitled *The Waste of Daylight*. Briefly stated, his scheme aimed at securing more daylight leisure for recreation and lessening the work performed by artificial light during the summer months. This was to be brought about in the following manner: The hour between two and three o'clock in the morning of each of the first four Sundays in April should be a short hour consisting of only 40 minutes, while the same hour in four Sundays in September was to be reckoned as 80 minutes. Greenwich and Dublin mean time were to be retained for purposes of astronomy and navigation as well as for legal and parliamentary documents unless otherwise signified. Shorn of technicalities, it simply meant that during the summer months people should rise an hour earlier than usual in the morning, begin work an hour earlier and finish an hour earlier in the afternoon or evening. The value of early rising has been extolled by wise men of all ages. Daylight saving has been practiced in the oldest of all industries—agriculture—probably since the creation of man; from the earliest times down to the present day it has been, and still is, in active, daily operation among the bulk of mankind—in Asia, Africa, Australia and the agrarian communities of America and Europe.

The movement started by Willett produced a heated controversy in the British Empire that spread over six years. Numerous municipalities and corporations welcomed the proposal and several private firms adopted it, though not by altering the clock, but by commencing daily operations an hour earlier. The fiercest opposition to the scheme came from prominent scientists and learned societies. Early in 1908 a Daylight Saving Bill was introduced in the House of Commons and, after passing a second reading, was

referred to a Select Parliamentary Committee, which reported favorably on it, stating that the proposal would not only be beneficial to the general health of the community at large, but would curtail expenditure on artificial light. The bill, however, did not reach the final stages in the House; a similar bill was introduced in the following year and also referred to a select committee, which reported against it. One of the main objections was advanced in behalf of meteorological instruments designed to record continuously day and night, and the system of daily international telegraphic reports of synchronous observations upon which weather reports are based. It was pointed out that acts of Parliament could produce no effect upon daylight; that gas or electric light could be saved by making more use of daylight without alteration of clocks, and that it would be just as reasonable to change the readings of the thermometer at a particular season. The late Sir John Milne, the astronomer, wrote, "The only people that have a shifty time are Mahomedans and savages, and it is now suggested that we should . . . join their ranks." Other prominent men asserted that the proposal was based upon self-deception, "rising at five and making yourself believe it is six o'clock." M. Charles Lallemand, scientist and administrator, was appointed by the French government to investigate and report upon the scheme. He condemned it *in toto*, maintaining that the position of the sun in the sky afforded the proper determination of time, and that an arbitrary displacement of noon, combined with differences of longitude, would operate very unequally in districts east and west of Paris, and that Brest would be as much as one and a half hours away from true time.

Up to the time of the outbreak of World War I repeated efforts were made in Great Britain to promote legislation on the subject, but without success. Willett died March 4, 1915. Though he did not live to see his cherished plan adopted except in isolated cases, he knew that it was supported by over 700 city corporations and town and district councils, as well as by hundreds of societies and associations.

The year 1916, however, was destined to witness a remarkable translation of theory into practice in the way of "daylight saving." In April its adoption was contemplated in Austria. On May 8, the question was raised in the House of Commons and advocated as a war measure of economy. Sir Henry Norman estimated that altogether \$12,500,000 would be saved in lighting. A bill was introduced on May 10, passed through both houses, received the royal assent on the 17th, and came into operation three days later. Farmers and munition workers expressed disapproval, the former deciding to adhere to the real as against the "sham time" shown by the public clocks. Although the bill referred explicitly to the year 1916 it gave power to extend the operation of the act in any year, so long as the war continued. Instead, however, of adopting the complicated Willett plan, it was decided to advance the clocks by a full hour on May 21 and return to normal time on October 1. The same month (May 1916) the system was introduced in Denmark, Germany and Holland; Italy, France and Portugal followed in June. In Germany, permanent adoption of the scheme was proposed in July; New Zealand rejected (after passing) it in August; Tasmania adopted it in

September; Victoria in November, and the Australian Dominion Parliament passed the measure to take effect in January 1917. The city corporation of London proposed permanent adoption, and in October it was actively urged in the United States. Norway decided in favor of daylight saving in May 1916, but rejected it in April 1917, as also did Denmark and Sweden in the same month, while Spain adopted it in May, at the same time that the Australian Cabinet decided to repeal the act. Turkey, Switzerland and Russia also adopted daylight saving; Nova Scotia and Newfoundland were the pioneers of the scheme in the New World. The French bureau in February 1917 suggested an international daylight saving conference to be held after the war.

UNITED STATES

During World War I, what has since become known as daylight saving time was established by act of Congress as a war measure. This act provided that between the last Sunday in March of each year and the last Sunday in October the standard time of each zone shall be advanced one hour; this provision was repealed after the close of World War I.

On Feb. 10, 1942, under a bill "To promote the national security and defense by establishing daylight-saving time" the standard time of each zone in the United States was advanced one hour; the bill provided for the termination of the act six months after the termination of the war or at such earlier date as Congress might designate. Daylight saving time was terminated in the United States by act of Congress Sept. 30, 1945.

Modern Daylight Saving Time which is limited to a few months each year is adopted locally in many cities and towns. Sometimes the whole matter is handled by state action.

A list of states observing daylight saving time during 1952 follows:

California	state law
Connecticut	state law
District of Columbia	district law
Illinois	observed in 213 places
Indiana	in 94 cities, business establishments open and close one hour earlier, but clocks remain on standard time
Kentucky	in 11 places
Maine	by all towns on railway lines
Maryland	in 55 places
Massachusetts	state law
Missouri	in 4 places
Montana	in 2 places
Nevada	in entire state
New Hampshire	state law
New Jersey	observed throughout the state
New York	all points on Long Island, all stations on Baltimore and Maryland Railroad, Delaware, Lackawanna, and Western Railroad, Erie Railroad, as far as Cleveland, Ohio, Rutland Railroad (except Burke and Knapps) and 229 other places
Ohio	in 38 places—all stations on Erie Railroad to Cleveland and Rittman
Oregon	in entire state
Pennsylvania	in 263 places, also cities and towns on the Reading Railway, Delaware, Lackawanna, and Western Railroad, and Lehigh Valley Railroad generally observe daylight saving time
Rhode Island	state law
Vermont	in 33 places, all stations served by the Baltimore and Maryland Railroad, Maine Central Railroad, Rutland Railroad, except New Haven, Salisbury and Whiting
Virginia	in 3 places
Washington	in 16 places
West Virginia	in 7 places

DAYS OF GRACE. The time of delay allowed for a bill to become actually due and payable, except in the case of bills payable on demand or at sight. In the United States and Great Britain the period is three days after the time expressed on the face of it, and these three additional days are called days of grace. In the United States, a bill or note becoming due on a Sunday or a holiday is payable on the first business day thereafter, but in England if the third day of grace falls on a Sunday, Christmas Day, Good Friday or a national fast or thanksgiving day, the bill is payable the day before.

DAYTON, dā't'n, **Jonathan**, soldier, congressman and signer of the Constitution: b. Elizabeth-Town, N. J., Oct. 16, 1760; d. there, Oct. 9, 1824. Graduated from the College of New Jersey (Princeton) in 1776, he served with his father, Col. (later Brig. Gen.) Elias Dayton in a number of the revolutionary campaigns, at Yorktown he held captain's rank. After the war he studied law and was admitted to the bar. He was a member of the New Jersey Assembly in 1787 when his father transferred to him his appointment to the Federal Convention. Jonathan Dayton was then twenty-seven years old and the youngest member of the Convention; he was one of the four signers for his state.

In 1789 he served in the New Jersey Council and the next year in the Assembly of which he was speaker. A member of the House in the 2d, 3d, and 4th United States Congresses, he was speaker in the 5th Congress. On March 1, 1793 in the debates on Hamilton's financial policy he and Elias Boudinot voted five times to sustain the policy against the attack of the Giles-Madison opposition. Dayton also served a term as senator (1799-1805), voting again repeal of the Judiciary Act of 1801 and in favor of the Louisiana purchase. A man of considerable wealth, he held title to some 250,000 acres in the Northwest Territory between the Big and Little Miami rivers. The township of Dayton, Ohio, was named for him in 1797. A friend of Aaron Burr, Dayton was indicted for high treason and misdemeanor on June 25, 1807, but nine weeks later a *nolle prosequi* was entered, so that he was never brought to trial. However, this involvement in the Burr "conspiracy" ended his political career on the national scene, though he subsequently held local offices and served two more terms in the New Jersey legislature (1814-1815).

DAYTON, city, Kentucky, in Campbell County, is located at an altitude of 540 feet, on the navigable Ohio River, opposite Cincinnati, Ohio; and on the Chesapeake and Ohio Railroad. Watch cases, jewelry novelties, paint and varnish are manufactured here. The two villages of Jamestown and Brooklyn, both settled in 1848, united in 1866, to form the city of Dayton. Pop. (1950) 8,977.

DAYTON, Ohio, city and county-seat of Montgomery County, situated in the heart of the fertile Miami Valley at the confluence of the Great Miami, Mad and Stillwater rivers and Wolf Creek. It is on the Baltimore and Ohio; Cleveland, Cincinnati, Chicago and Saint Louis; New York Central System; Erie and Pennsylvania railroads, 67 miles southwest of Columbus

and 47 miles north of Cincinnati. The city has an area of 25.91 square miles.

Manufacturing Interests.—While Dayton's manufacturing industries, numbering 503 in all, are widely diversified, many establishments ordinarily employ from 500 to 5,000 persons. The average number of wage earners in industry is about 83,000 with a total payroll of over \$517,000,000 and with the value of products exceeding \$825,000,000. Many of these industries require great precision with the result that the number of skilled workers forms a high percentage of the total. The city is known throughout the world as the leading manufacturer of many commodities. In several of these, Dayton's position is really important; in some, outstanding; in three or four, even spectacular. Examples are: Acid-proof equipment, cash registers, computing scales, electric refrigeration equipment, fare and autographic registers, government stamped envelopes, electric light and water plants for home use, fan belts, automobile tires, golf clubs, ice cream cones, porous metal bearings, shoemakers' lasts, water softeners, paper and wood boxes, paper, paper-cutting machinery and knives, cakes and crackers, machine tools, plastics, machinery, patterns, hard rubber products, electric motors, automotive parts and accessories, castings and forgings, lifting jacks, boilers, fire-fighting equipment, labels and greeting cards, paint and varnish, air-conditioning equipment, bicycles, filling-station equipment, tools and dies cement, marking systems, soaps, pumps and compressors, and household appliances. In close proximity to Dayton is the enormous paper industry of the Miami Valley, which turns out one-half of the state's production of paper. This includes all kinds of fine writing paper and printing paper and miscellaneous paper with the exception of newsprint.

Aviation.—Dayton has taken a major part in the development of aviation. The city was the home of the Wright Brothers. It is also a center of aeronautical research and experimental work. Its citizens purchased 5,000 acres of land to present to the United States Government. This tract was named Wright Field in honor of the Wright brothers. Patterson Field is also located on this Government reservation and is one of the largest flying fields in the world. Dayton's more recent advancement as an aviation center has been in the purchase and modernization of the Dayton Municipal Airport, nine miles north of the city. Three hundred and eleven acres were acquired and improved with concrete runways, drainage, night lighting and other facilities at a cost of over \$700,000.

Parks and Playgrounds.—The city has a well-managed recreational department under city administration. There are 21 parks, with a total of 1,100 acres. Playgrounds are located at points within a half mile of the residential section intended to be served. Each playground is under constant supervision. Island Park, a 23-acre island in the Miami River, offers recreation features, including boating and bathing.

Hospitals.—There are four large hospitals in and near the city—two for medical and surgical cases, the state hospital for mental cases, and a sanitarium for tubercular cases. In addition, there are several small private hospitals.

Government.—Dayton was the first large city to adopt the city-manager form of government. The change in the form of city govern-

ment was concurrent with the plans and program for flood prevention. Since Jan. 1, 1914, Dayton has been under the commission-manager plan of city government. In November 1913 the first commission was elected. The five men chosen could not have been induced to hold public office under the old conditions. None had been actively partisan and their election was nonpartisan. Dayton's commission-manager form of government and its charter's principal features are: 1. A commission or council of five, elected at large on a nonpartisan ticket, whose duties are purely legislative and policy-determining; 2. The manager is appointed without regard to his political beliefs and need not be a resident of Dayton at the time of his appointment. His principal duties are as follows: (a) Supervision of departmental administrations; (b) execution of laws and ordinances; (c) recommendation of legislative measures; (d) appointment and removal of heads and sub-heads of departments without restriction. Employees of classified service are subject to the civil service provisions of the charter; (e) preparation of the budget. 3. Initiative, referendum and recall. 4. Five departments, namely law, public service, public welfare, public safety and finance. 5. Power of commission to discontinue any department. 6. Advisory boards of citizens to serve without compensation, whose duties are to consult and advise with departments.

Education.—Dayton's public school system is exceptionally well planned, and includes schools for the handicapped that are equipped to provide corrective physical treatment as well as academic instruction. The University of Dayton, a Catholic co-educational institution founded here as Saint Mary's Institute in 1850, completed an extensive building program in 1938, has a 57-acre campus and a 7,000-seat stadium, and offers standard university courses. Dayton is also the seat of Bonebrake Theological Seminary, which dates from 1871 and is under the auspices of the United Brethren Church; and the Dayton Art Institute, completed in 1928 at a cost of \$1,300,000, offers many cultural advantages to the community in addition to its excellent art courses. The Dayton public library has more than 360,000 volumes, and also owns valuable historical and ethnological collections. Frequent lectures on museum specimens are available to school children through special arrangements.

History.—The site of Dayton was selected in the winter of 1795-1796. The first settlers arrived in the spring of 1796. Dayton township was formed in the winter of 1797 and was named for Gen. Jonathan Dayton. It became the county seat in 1803 and was incorporated in 1805. In that year it suffered from its first flood. Other disastrous floods occurred in 1814, 1828, 1832, 1847, and 1913. A flood-prevention system was constructed following the 1913 flood. Completed in 1922 it insures the entire valley from flood waters. The five dams comprising the control system cost \$32,000,000. Levee and channel improvement, relocation of railroads, highways, and wire lines, the lowering of water and gas mains were other features. Pop. (1940) 210,718; (1950) 243,872.

DAYTON, city, Tennessee, seat of Rhea County, is located in the southeastern part of the state, 38 miles northeast of Chattanooga, on the Southern Railway System, 18 miles from

Watts Bar Dam, and on Richland Creek, which flows into the main channel of the Tennessee River and Chickamauga Lake, with a 9-foot channel to the Gulf of Mexico. Altitude 705 feet. The hub of the Tennessee Valley Development, Dayton is in a farming, dairy and industrial region raising livestock, strawberries, peaches, corn, hay, wheat, and vegetable truck; oak and pine timber, coal, iron ore, clay, and limestone are available. The city has a grain elevator, cattle commission barn for cattle sales, creameries, nurseries, food freezing plants for beans and strawberries, flour and feed mills, hosiery and underwear mills; building block, gas stoves, crates and baskets, lumber and fertilizer are also manufactured. Besides a small university (William Jennings Bryan) the city has a high school, grade schools, a library and 2 hospitals. The so-called "evolution trial" (see SCOPES CASE) was held here in July, 1925. Founded about 1884, the city obtained a charter in 1895 and has a commission form of government. Pop. (1940) 1,870; (1950) 3,191.

DAYTON, city, Washington, and seat of Columbia County, is located on the Touchet River, 30 miles northeast of Walla Walla, on the Union Pacific, and Northern Pacific railroads. Altitude 1,605 feet. Dayton is a residential town in a productive farming region; packs and cans vegetables and fruit; ships wheat and apples; and is famous for its beef cattle and sheep. Nearby are the Lewis and Clark Trail State Park, and the Umatilla National Forest Reserve. First settled in 1855, Dayton was laid out in 1871, made the county seat in 1875, and incorporated in 1876. Pop. (1950) 2,979.

DAYTONA BEACH, dā-tō'nā, city, Florida, in Volusia County, is located on the Atlantic Ocean and the Halifax River, a long lagoon parallel with the sea; 73 miles south of Saint Augustine on the Florida East Coast Railway, with airlines, and water transportation, which enters the river 7 miles south through the Ponce de Leon Inlet, on which there is a lighthouse. Dock facilities, yacht basins and the like are located in the river, as Daytona Beach has no ocean harbor. Built upon both the mainland and the peninsula, the two sections being joined by toll-free bridges, the city is exceptional in having not only ocean frontage but two river banks ideally adapted to residential purposes, together with miles of inland streets adorned by subtropical trees and shrubs. Daytona Beach is a resort city, with year round attractions, well-planned outdoor recreation facilities, water sports, motorboat racing, an ocean pier and museum, and fine fishing. It is famous for its beach, a magnificent stretch of hard-packed white sand, 23 miles long and 500 feet wide at low tide, affording a natural roadway for automobiles, and the scene of many motor speed trials, including that of Sir Malcom Campbell's "Bluebird." The chief industrial activities are boat building and the handling of citrus fruit. The city has excellent schools and libraries, and is the seat of the co-educational Bethune-Cookman College, for Negroes. Points of interest are the exotically planted Riverfront Park, on the west bank of the river; Oceanfront Park which has what is stated to be the largest outdoor band-shell in the world, and a cement oceanside promenade 50 feet wide and nearly 2,000 feet

long; and City Island Park, a modern amusement center. Laid out in 1870 by Mathias Day of Ohio, and named Daytona for its founder, it was incorporated in 1876; had its first railroad in 1888; and in 1927 was consolidated with the peninsula towns of Daytona Beach and Seabreeze and chartered as the city of Daytona Beach. Pop. (1940) 22,584; (1950) 30,187.

DAZA, da'sā, **Hilarión Grosolé**, Bolivian general and politician: b. Sucre 1840; d. Feb. 28, 1894. He entered the army in 1857, and became a major under President Melgarejo, but later joined Morales, assisting in Melgarejo's defeat in 1871. Daza rose to political power, and was made president May 4, 1876, succeeding Frias; but his failure as a military commander in the war against Chile, through which Bolivia lost its Pacific Coast territory, caused him to be deposed Dec. 27, 1879. He fled to Paris to escape assassination, a fate that overtook him when he later returned to Bolivia.

D'AZEGLIO. See AZEGLIO, MARCHESE DI (MASSIMO TAPARELLI).

DEACON (from the Greek *diakonos*, a servant), in the Christian churches a subordinate minister or officer whose duties vary with the different denominations, the office itself having been instituted by the apostles (Acts, chap. 6), to administer the charitable work of the church. In the Roman Catholic, Anglican and Episcopal churches the diaconate is a step towards the priesthood, its duties being to assist the priest, presbyter or elder at the altar and in the parish, subject to limitations individually defined by the separate church bodies, broadly as follows. The Roman Catholic church permits the deacon to baptize, preach or administer the eucharist in emergency or by special permission; the Anglican and Protestant Episcopal deacons may preach by special permission, but may not consecrate the elements of the Lord's Supper, nor pronounce the absolution or benediction; while in the Methodist church, the deacon being second in ministerial rank (the bishops having only administrative powers), performs baptismal and marriage rites, and preaches as an itinerant. In Congregational and Baptist churches deacons are lay officers who distribute the elements at communion, dispense alms, form the minister's advisory council, and look after church property, and in Presbyterian, Reformed and Lutheran churches they administer charities and temporal affairs. In the Eastern churches the office has been preserved as it existed in the Apostolic church except for slight modifications.

Consult Hastings, James, ed., *Dictionary of The Bible* (New York 1942); McSorley, Joseph, *An Outline History of the Church by Centuries* (St. Louis 1945); Ferm, Vergilius, *An Encyclopedia of Religion* (New York 1945); Moore, George Foot, *The History of Religions* (New York 1949).

DEACONESS, in the time of the apostles, a woman, usually a widow, who assisted the minister in spiritual matters affecting her own sex, visiting the sick, dispensing alms, instructing candidates for baptism, and serving as ushers in the women's part of the churches. That the deaconesses of early times were widows is shown by St. Ignatius, who spoke of "virgins who are called widows;" words held as clear a proof of the original custom of choosing widows

only to be deaconesses, as would be the formal declaration that such custom existed. For a long time it was required that the deaconesses should be not less than 60 years old; by the councils of Chalcedon and in Trullo the age of 45 years was made the minimum; by the Council of Chalcedon deaconesses were forbidden to marry; and no widow who had married a second time was ever admitted to the rank of deaconess. The institution of deaconesses was extinct in the Western Church in the 10th century and in the Greek Church in the 12th; but it survives in churches of the Syrian rites.

The work done by the deaconesses in the early centuries is performed now, in the Roman Catholic, and in many of the Protestant Episcopal, churches by the nuns. (See SISTERS). In the 19th century the order of deaconesses was revived in several of the Protestant churches. Theodore Fleidner (1836), of the United Evangelical Church of Prussia, founded a home for deaconesses, in Kaiserswörth, Prussia. Germany has several homes, and in 1855 the order was established in Baltimore, Md. The General Convention of 1889 adopted a canon regulating the order and providing that members should have adequate preparation both technical and religious, extending over a two-year period. Training schools are maintained in New York and Philadelphia. The Methodist Episcopal Conference in 1888 provided for the establishment of an order of deaconesses, and this church now has many homes in the United States. The Lutheran Church also maintains several homes, the first being established in New York in 1852. In 1891 the Presbyterians instituted the order. Consult Golder, 'History of the Deaconess Movement' (Cincinnati 1903); Nutting and Dock, 'History of Nursing' (New York 1907); Potter, 'Sisterhoods and Deaconesses' (London 1898); 'Year Book' of the New York Training School for Deaconesses (New York 1892-1915).

DEAD, in nautical language, a word frequently employed as part of a designation or phrase having, in general, a meaning somewhat opposite to that of active, effective or real. The chief of such phrases are the following: Deadeyes: circular, flattened wooden blocks, without sheaves, and having eyes for lanyards, which form a purchase or tackle whereby the shrouds or other parts of fixed rigging are extended or set-up taut; dead-flat: the name for one of the midship-timbers; dead-lights: strong wooden shutters used to close cabin windows, on the approach of a storm, to protect the glass; dead-ropes: such as do not run in blocks; dead-wood: the term applied to the solid blocks of timber erected upon the keel throughout the sharp portions of a ship's hull at stem and stern, the chief object being to give solidity and strength to the ends of the ship.

DEAD, Book of the. See **BOOK OF THE DEAD**.

DEAD, Disposal of the. In every age and in all countries, the living have shown their respect for the dead by various modes of burial ceremony, and the religion and laws of all countries reflect in large measure this feeling of reverence for the memory of those who have gone before. The methods of disposal of the dead are many, and historic romance has preserved for us many interesting and pretty cus-

toms. In the main, however, three methods are largely employed by modern peoples — burial, embalming or its modifications or cremation with its modifications. It is impossible to tell which method has the greatest antiquity, but probably simple burial antedated the other, since cremation and embalming usually imply a complex religious development. The Hebrews, the Greeks and the Romans in the main buried their dead, their burying-grounds having been located outside of town walls; but cremation also was largely practised by the Greeks, and it has been thought that Hebrews at one time likewise burned their dead. As is well known, embalming was widely customary among most of the nations of antiquity, although the Egyptians may be said to have been the foremost of those employing it.

The argument in favor of cremation is based principally on sanitary grounds, and despite the general sentiment against it, cremation has made considerable progress in the United States and other countries. There are crematories in many of the leading cities of America, and while much of the feeling against cremation has undoubtedly passed away, there is still great general dislike to burning of the dead.

Apart from methods of antiquity, the problem of disposing of the dead with least danger to the living is, from the medical point of view, one of great interest. Its discussion is by no means of recent origin, however, for the early Italians, French and English contributed learned treatises on the subject. It would seem that from the scientific point of view most of the modern writers and those of the Middle Ages strongly favor cremation as one of the cleanest and most efficient modes of disposal of the dead, and it is a matter of history how the ancient Etruscans and others had their burial urns in which to keep the ashes of their forbears.

The method of burial beneath the ground is condemned by practically all sanitarians, but it will probably be many generations before the custom is abandoned, if indeed it is ever to be given up. As to actual dangers that may arise from dead bodies buried beneath the ground, it cannot be claimed that these are imminent. Disease is mainly transmitted from the living person, and now that we have more definite knowledge of factors involved in the transmission of disease, the boggy of danger arising from burial has little terror for us. It can hardly be claimed with much show of justification that such a water-born disease as typhoid can originate from the water that may percolate through the ground in cemeteries and ultimately reach a potable supply. This danger is theoretical rather than practical, and the amount of time spent in devising methods to prevent such contamination would be much more rationally employed in taking care of the excreta of the living. The contamination of the earth, the air and the water is, therefore, really of secondary importance; yet it cannot be denied that, excepting some exclusive cemeteries, the present methods of burial are disgusting; and in times of war or pestilence not only is burial disagreeable, but there is no doubt that contagion may arise from it, and hence special portable crematories have an undeniable place. See **CREMATION OF THE DEAD**.

DEAD-LETTER OFFICE. The department of the General Post Office at Wash-

ington, D.C., to which all undelivered or technically "dead" mail is sent, and from which, after examination, such mail, whenever possible, is returned to the sender. See also POST OFFICE DEPARTMENT.

DEAD LINE. A phrase which probably originated during the Civil War. In some of the prison camps a line was drawn through or around the camp. If a prisoner attempted to cross the line he was shot at once. To the men it became the dead line.

In printing, the dead line is a line made on the bed of a flat-bed cylinder press to guide in the placement of the chase on the press. See also DEADLINE.

DEAD NETTLE or **LAMIUM**, a genus of about 40 species of annual or perennial herbs of Eurasian origin and distribution, belonging to the mint family (Labiatae). The name dead nettle refers to the general resemblance of some species to true stinging nettles, without the stinging hairs. Henbit (*L. amplexicaule*) is an annual or winter-annual, whose seeds germinate in September or October and whose seedlings survive the winter and bloom in February or March. The leaves are opposite, mostly cordate at the base, the lowest being small and long-petioled, the middle ones usually toothed and the upper ones bracteal subtending the whorled flower-clusters. The flowers are two-lipped, the upper lip often arching or hooded, and white, yellow, red or purple in color. Several annual species are introduced weeds, whereas a few others are cultivated as border plants or grown in rock gardens. The yellow archangel (*L. Galeobdolon*) is grown in wild gardens.

THEODOR JUST.

DEAD RECKONING, computation of a ship's position without recourse to astronomical observations. This reckoning is computed from the following data—the longitude and latitude sailed from or last determined; the course or direction sailed (determined from the compass); the rate of sailing; and the time elapsed. These data are liable to many inaccuracies, due to currents and change in declination of the compass. The results arrived at by this method of reckoning are corrected as soon after as is possible by sun or stellar observation. See also NAVIGATION.

DEAD SEA (Hebrew YĀM SEA, or YAM HAMMELACH, SALT SEA), called BAHR LUT, "Sea of Lot," by modern Arabs; Old Testament calls it the "Sea of the Plain," sometimes "The East Sea"; Josephus speaks of it as "Lake Asphaltitis." Forty-seven miles long and nine and a half miles at its greatest breadth, the Dead Sea covers an area of 340 square miles. Forming the southeastern boundary of Palestine, it lies in a part of a great fault which dates from the Tertiary period. The surface of the water lies 1,292 feet below sea level. In the northern part the sea reaches a depth of 1,310 feet. El Lisan (The Tongue) is a peninsula extending northwestward from the southeastern shore. South of El Lisan the water ranges from 3 to 13 feet in depth.

On the southwestern shore is Jebel Usdum (Mountain of Sodom), five miles in length, one half to three quarters of a mile wide, 400 to 600 feet in height. At its base is a stratum of rock salt, 150 feet thick. In the seams of the stratum

and in the clay above is found marl mixed with lumps of free sulphur the size of a man's thumb.

During the past fifty years the level of the sea has risen about 20 feet. An island in the northern part of the sea has disappeared during that time and is now covered by seven feet of water. The southern end of the sea has come into existence as a result of this overflow, submerging a small forest of trees whose trunks are still visible El Lisan, composed of white calcareous marl, is from 40 to 80 feet in elevation, but has a range of hills attaining a height of 300 feet. It shows the remains of a Roman road which comes to an end at the edge of the water. Centuries ago this road connected with the western shore. The Hebrews called the area south of The Tongue the "Vale of Siddim."

The site of Sodom and Gomorrah lies beneath the waters of the southern end of the sea.

The Dead Sea is fed mainly by the Jordan River which enters at the northern end and discharges an estimated volume of 6,000,000 tons daily. It is fed, also, by many smaller streams from east and west. Chief among these are Wady Zerka Ma'in, Wady Mojib (Arnon), Wady-el-nar (Kedron), and Wady Zared. Most of the water discharged into the sea is carried away by evaporation.

There is evidence that the water once stood 1,180 feet above its present level. In the days of Abraham, however, about 2100 B.C., the level of the water was lower than today. Evidence from archaeological and historical sources outside the Bible supports the record of a terrific catastrophe in this area about the time of Abraham.

The water contains 27 per cent solid substance—common salt, chloride of magnesium, chloride of calcium, gypsum, potash, and other chemicals. The chloride of magnesium imparts an extremely bitter taste, and the chloride of calcium gives an oily appearance and feeling. The specific gravity of the water is 1.166, so that the human body will not sink in it, and a piece of wood thrown into the water lies as though on a mirror. The value of the chemicals has been estimated at over \$1,268,000,000,000. An industrial company, organized to recover these salts, is now in operation near the northern end of the sea.

No life is found in the sea except at the extreme northern shore where there are small fish which quickly die.

The eastern shore, mostly sandstone, is almost precipitous and forms part of the high plateau of Moab which rises 3,100 feet above the Mediterranean and is, therefore, more than 4,400 feet above the Dead Sea. The western shore, mostly limestone, is the plateau of Judea rising 2,000 feet above the sea. The remains of several towns have been found at the southern end of the sea but no trace of human habitation at the northern end. The southern shore is impregnated with sulphur, oil, pitch, tar, and bitumin. It is possible to turn up, with the toe of the shoe, great flakes of salt mingled with sulphur. The region is not volcanic but there are evidences of severe earthquake action. The entire area about the sea is a burned-out region of oil and asphalt with an accumulation of gases and is almost unbelievably desolate.

The valley, in its entire length, is known in geology as the Miocene Rift. The portion at the Dead Sea is the deepest part of that rift although the smallest part of its length, and is the deepest known fault or fracture on the earth's

surface. Geologists believe that the Jordan Valley fault is only a continuation of the great African Rift Valley, which, beginning with Lake Nyassa, south of the equator, includes Lakes Tanganyika, Albert Edward, and Albert, and extends northward through Coele-Syria between Lebanon and Anti-Lebanon.

The summer temperature reaches 140°F. and the winter temperature does not fall below 80°F.

HAROLD F. BRANCH.

DEAD SOULS. Gogol was indebted to the great Russian poet, Pushkin, for the subject of his epoch-making satire, *Pokhozhdéníya Chichikova ili Myertvúya Dushi* (*Chichikov's Adventures or Dead Souls*)—perhaps better translated *Dead Serfs*) and to *Don Quixote* for its plan. Under the old regime in Russia the serfs, fastened to the soil by the economic regulations of the usurper tsar, Boris Godunov, who was compelled to stop by drastic measures the emigration of farmhands, were regarded as personal property and the *pomyéshiki*, or landed proprietors, were allowed to mortgage them to the state bank. The census was taken only once in ten years, and it naturally happened that in the intervals many serfs died. It was argued that the birth rate would offset the death rate, so that taxation on the basis of the previous enumeration would be fairly equitable.

In Gogol's tale, which he called a poem, a wily rascal, the collegiate councillor, Pável Ivánovitch Chichikov, conceives the scheme of going from place to place and getting by hook or by crook, by purchase or by gift, the title to such serfs as had died since the previous census. With the long list thus acquired he plans to borrow enough ready money to purchase a genuine estate with living souls. His journeys bring him into contact with all sorts and conditions of men and women. Gogol describes them without mercy, showing the deleterious influence of serfdom on owner and serf alike. As in *Uncle Tom's Cabin*, to which *Dead Souls* has been compared, there is no attempt to preach; the implication is permitted to carry its own weight. The emancipation of the muzhiks had been advocated by enlightened Russians for many years, especially during the reign of Alexander I (1801-1825); during the reign of Nicholas I (1825-1855), who was occupied with other affairs, the reform slumbered or at least was put aside, and not until Alexander II had come to the throne was the liberation actually effected. It had been made necessary by the demand of popular sentiment stimulated by *Dead Souls* and by Turgenev's *Recollections of a Sportsman*.

Dead Souls was to have consisted of three parts. The first part appeared in 1842 and created a sensation. A second edition followed in 1844. It naturally aroused bitter enmity among the proprietor class who felt that they had been traduced. The author, who was a sick man, tried to make explanations; he begged his readers to wait for the conclusion before they formed their final judgments. But he grew more and more hypochondriacal, and in a fit of melancholy he burned the manuscript of the second part which was only partially finished. After his death in 1852, an earlier draft was discovered and incorporated with the first. Later a Dr. Zaharchenko of Kiev took it upon himself to continue and finish Gogol's masterpiece, but it was a dead failure.

The chief interest of *Dead Souls* is historical:

it depicts a condition forever passed away, but its gallery of portraits and of landscapes shows vividly what Russia was in the first half of the 19th century. Chichikov, shrewd, plausible, tactful, ambitious; his lackey, Petrushka, taciturn, stupid, ugly; his coachman, Selifan, talkative, with his head in the clouds and always getting lost; his troika of horses (a three-fold Rosinante), each with its own individuality; his "brichka" with leather flaps and staring bull's-eyes—all are as familiar to the Russian reader as Don Quixote and Sancho Panza to readers in the West. In Russian literature the names and varied characters of Chichikov's dupes frequently appear without explanation: they are household words, and many of the sayings so wittily and often sardonically introduced by Gogol have become proverbs. The work is only a torso, but in its details it became the model for many successive Russian writers who affected his style of realism.

Myertvúya Dushi fills the third volume of Gogol's collected works published in a beautiful edition by T. I. Hagen, Moscow 1884. It was translated by Isabel F. Hapgood and published, New York 1886, London 1888. It is analyzed by the Vicomte de Vogüé in *Le Roman russe* (*The Russian Novelists*, Boston 1887), and in Ernest Dupuy's *Great Masters of Russian Literature*.

Dead Souls was translated into French under the title, *Les Ames mortes*, by Ernest Charière (Paris 1885), and the first part into German, as *Die toten Seelen, ein satirisch-komisches Zeitgemälde* by Philipp Löbstein in 1872.

NATHAN HASKELL DOLE.

NOTE: A new English translation of *Dead Souls* by George Reavey was published in 1948. *Nikolai Gogol* by Janko Lavrin (New York 1952) is a recent critical study.

DEADLINE or DEAD LINE is the hour at which the printing forms of a newspaper, magazine, or book, are locked. After that time no copy can be inserted.

DEADLOCK, a novel by Dorothy M. Richardson (1882-), published in 1921, a section of the 12-part novel sequence *Pilgrimage*. The author employs interior monologue technique, her central figure seeming a personal projection.

DEADLY NIGHTSHADE. See BELLA-DONNA.

DEADWOOD, city, South Dakota, and Lawrence County seat, altitude 4,545 feet, on the Chicago and North Western and the Burlington railroads and on federal highways, 20 miles east of the Wyoming line; one of the principal trading centers for the mining camps of the Black Hills. Mining, smelting and refining of ores, lumbering, the tourist business, and raising livestock are the main industries. The government is administered by a mayor and council. The town has public library facilities, a memorial museum, and a hospital, and there is a Theodore Roosevelt monument. The town was settled during the gold rush of 1876. After John Pearson struck "pay dirt" in Deadwood Gulch some 25,000 miners and adventurers flocked to the diggings. The boom lasted until most of the gold was exhausted several years later. Wild Bill Hickok was murdered here on Aug. 2, 1876. Pop. (1940) 4,100; (1950) 3,288.

DEAF, DUMB, AND BLIND. "Obstacles are things to be overcome" is the motto given by Dr. Samuel Gridley Howe (q.v.) to the Perkins Institution for the Blind. When this remarkable man learned in 1837 that in Hanover, N. H., there was a little girl not only blind but also deaf and dumb, he eagerly sought out the child and obtained the parents' consent to take her to South Boston to be educated. He had already formed a theory as to how he would reach a mind thus doubly shut in, and with the finding of Laura Bridgman (q.v.) came the wished-for opportunity to test this theory. It should be noted that Laura Bridgman saw and heard until she was two years old. She had been rather a delicate child, however, having enjoyed only about four months of robust health, when she sickened, her disease raging with great violence during five weeks, "when her eyes and ears were inflamed, suppurated and their contents were discharged." Her sufferings continued for months, and it was not "until four years of age that the poor child's bodily health seemed restored." She was intelligently active, following her mother about the house, seeming anxious to feel everything and thus to learn about it; and she developed signs for her father and her mother, and for some things.

She was eight years old when brought to the Perkins Institution. Dr. Howe writes: "There was one of two ways to be adopted: either to go on and build up a language of signs on the basis of the natural language, which she had already herself commenced, or to teach her the purely arbitrary language in common use; that is, to give her a sign for every individual thing, or to give her a knowledge of letters, by the combination of which she might express her idea of the existence, and the mode and condition of existence, of anything. The former would have been easy, but very ineffectual; the latter seemed very difficult, but, if accomplished, very effectual; I determined, therefore, to try the latter."

After the child had become adjusted to the change of homes, Dr. Howe began teaching her by means of common articles with which she was familiar—spoons, forks, keys, etc., on which labels with their names printed in raised letters had been pasted. Similar detached labels were given her to feel. Her touch was acute enough; hence she was able to match labels, placing that for book on the book, etc. She did this easily and willingly because she received approbation for so doing; but the idea that the printed word stood for the name of the object had not entered her brain. Then other detached labels were cut up into their component letters. These her memory soon enabled her to build into wholes or the words she had felt. Such exercises continued for many weeks to be only a meaningless play to the child. The success had been "about as great as teaching a very knowing dog," when suddenly the idea flashed upon her that: "Here was a way by which she herself could make up a sign for anything that was in her own mind, and show it to another mind, and at once her countenance lighted up with a human expression; it was no longer a dog or parrot—it was an immortal spirit, eagerly seizing upon a new link of union with other spirits! I could almost fix upon the moment when this truth dawned upon her mind, and spread its light to her countenance; I saw that the great obstacle was overcome, and that henceforward nothing but patient and persever-

ing, plain and straightforward efforts were to be used."

Next, she was given metal type, each bearing some embossed letter, and a frame with holes to receive them. With this appliance Laura readily wrote the name of any object she knew, and by writing them fixed in mind an extensive vocabulary of common names. Then the less cumbersome manual alphabet was taught her. Here was a means by which she could both write and read; she could spell to her teacher and read what her teacher spelled into her hand. Dr. Howe's reports teem with interesting psychologic material. At the end of the year he writes: "She is nine years of age, and yet her knowledge of language is not greater than a common child of three years. There has been no difficulty in communicating knowledge of facts, positive qualities of bodies, numbers, etc.; but the words expressive of them, which other children learn by hearing, as they learn to talk, must all be communicated to Laura by a circuitous and tedious method. In all the knowledge which is acquired by the perceptive faculties, she is of course backward, because, previous to her coming here, her perceptive faculties were probably less exercised in one week than those of common children are in one hour."

And so her instruction went on. Through it all the child showed an eagerness to learn and to put herself in touch with the world that was a powerful aid to the teacher. In a few years, when Oliver Caswell, also deaf, dumb and blind, came to the institution, Laura naturally took great interest in teaching him, and thereby profited much herself. As she approached womanhood her education was already good. She had learned to sew, to knit, and to do fancy work. She often visited her home, but her true home was the institution; there she died in her own year, the first case of anyone so afflicted made capable of leading an industrious and happy life, and as the first case, historically the most remarkable.

Popular interest in Laura Bridgman, both in the United States and abroad, was naturally very great. The printed reports of her progress were eagerly awaited, and distinguished foreigners coming to Boston visited her. Charles Dickens wrote in his American notes a sympathetic account of his impressions of her. Dr. Howe made provision in his will for her financial independence, and in his last long report spoke of her unflinching cheerfulness, affectionate nature, and great enjoyment of life.

In the year 1887 something like the old interest was aroused by accounts of the brilliant deaf, dumb, and blind child in Alabama, Helen Keller (q.v.). This child had lost sight and hearing at 19 months as a result of a serious illness. Like Laura she kept actively interested in all that surrounded her, and like Laura she developed her own little language of signs. When she was six years old, her friends, who knew of Laura Bridgman's case, applied to Boston for a teacher. In the following year Miss Annie M. Sullivan was sent. This lady was able to put herself in touch with Helen in a very short time and in a marvelous way. In fact, she proved herself to be a most remarkable teacher. Following in general the methods adopted in teaching Laura, Miss Sullivan began her work by putting Helen in possession of the manual alphabet. A doll was happily chosen to begin

with; and with the doll on the child's lap, the teacher formed in Helen's hand the finger letters *d-o-l-l*. Other familiar objects were similarly introduced, and strange as it may seem, that which had taken three months to reach in Laura's case, in Helen's took but a few days; or, in Miss Sullivan's words, "it was not more than a week before she understood that all things were thus identified." Her teacher wrote: "Never did a child apply herself more joyfully to any task than did Helen to the acquisition of new words. In a few days she had mastered the manual alphabet and learned upward of 100 names." After teaching verbs and prepositions through action and position, Miss Sullivan made a departure. She began to use new words in connection with old words, letting Helen understand them if possible from the context. The child adopted these words "often without inquiry." In this way she became familiar with the use of many words whose meaning never had to be explained to her.

As to the letters of the raised alphabet, Miss Sullivan wrote: "Incredible as it may seem, she learned all the letters both capital and small in one day." Then came the primer; then pencil writing than which there is scarcely a more difficult exercise for the blind to learn; and yet Helen "wrote without assistance a correctly spelled and legible letter to one of her cousins; and this was only a little more than a month after her first lesson in chirography." Braille, or tangible point writing, became a constant delight to her.

Words like "perhaps" and "suppose" and those indicative of abstract ideas she learned more through association and repetition than through any explanation of her teacher. The child had the language sense largely developed. Much of the time when no one was talking with her she was reading in books printed in raised letters. Dr. Bell, in trying to account for Helen's wonderful familiarity with idiomatic English, considered of great significance the statement of Miss Sullivan, that "long before she could read them [the books] . . . she would amuse herself for hours each day in carefully passing her fingers over the words, searching for such words as she knew."

In 1888, when Helen was eight years old, her teacher took her to South Boston, where she could have the advantage of all the appliances and embossed books that a school for the blind affords. Thenceforth an account of her progress reads like a romance. It was no more difficult for her to learn a new word in German or in Greek than in English; and she took great delight in picking up and using French or Greek phrases. When later she came to study these languages, she seemed to advance without effort in the knowledge of them. The educators of the deaf, who have good reason to comprehend the exceeding difficulty of teaching their pupils to articulate intelligibly, feel that Helen Keller's rapid mastery of speech is by all odds her most wonderful achievement.

After she had been in South Boston some little time she heard of a Swedish girl afflicted like herself, who had learned to speak, and she said, "I must learn to speak." Miss Sullivan took her to Miss Sarah Fuller, principal of the Horace Mann School for the Deaf, and although Helen's only means of learning the position of the vocal organs in speech was to put her fingers

on the lips, tongue, teeth, and throat of the speaker, she learned in 10 lessons to articulate so well that she could carry on an intelligible and audible conversation, having communication addressed to her spelled into her hand by the manual alphabet. She learned afterward to read from the lips and throat of a speaker by placing her fingers lightly on them, so that any one sitting near her can converse with her as though she could both hear and see.

Helen spent a winter at the Wright-Humason Private School for the Deaf, where she improved her articulation. When she was 16 years old she entered the Cambridge School for Girls, Miss Sullivan accompanying her. There, under the guidance of Mr. Arthur Gilman, the director of the school, she took the course preparatory to entering Radcliffe College. At the end of one year she took the regular required examinations in the history of Greece and Rome, in English, in Latin, in elementary French, in elementary German and in advanced German. As the questions and other matter were read into her hand by Mr. Gilman himself, Helen wrote her answers and translations on an ordinary typewriter. She passed the tests in every subject, taking "honors" in English and German. Mr. Gilman wrote: "I think that I may say that no candidate in Harvard or Radcliffe College was graded higher than Helen in English." She entered Radcliffe in 1900 and was graduated in 1904, receiving her A.B. degree *cum laude*, or with distinction. Miss Sullivan remained with her throughout, acting everywhere as interpreter. Miss Keller lived with her faithful friend and teacher until Miss Sullivan (later Mrs. John A. Macy) died in 1936. She lectured throughout the United States and in England, Scotland, Yugoslavia, and Japan, the Japanese tour being under the auspices of the government and organizations for the blind. The University of Glasgow gave her the LL.D. degree in 1932. Following *The Story of My Life*, she wrote other books including *Midstream—My Later Life*, and played in *My Deliverance*.

The other deaf, dumb, and blind children who have come under instruction at either schools for the blind or schools for the deaf must always have a special teacher and use embossed books and adapted appliances. All have been or are being taught on principles employed in teaching Laura Bridgman and Helen Keller. (See also DEAFNESS.)

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EDWARD E. ALLEN,
Director of Perkins Institution and Massachusetts School for the Blind.

DEAFNESS. Deafness may be defined as the impairment, loss, or lack of the sense of hearing. An understanding of normal hearing is, therefore, essential to a consideration of the problems of deafness.

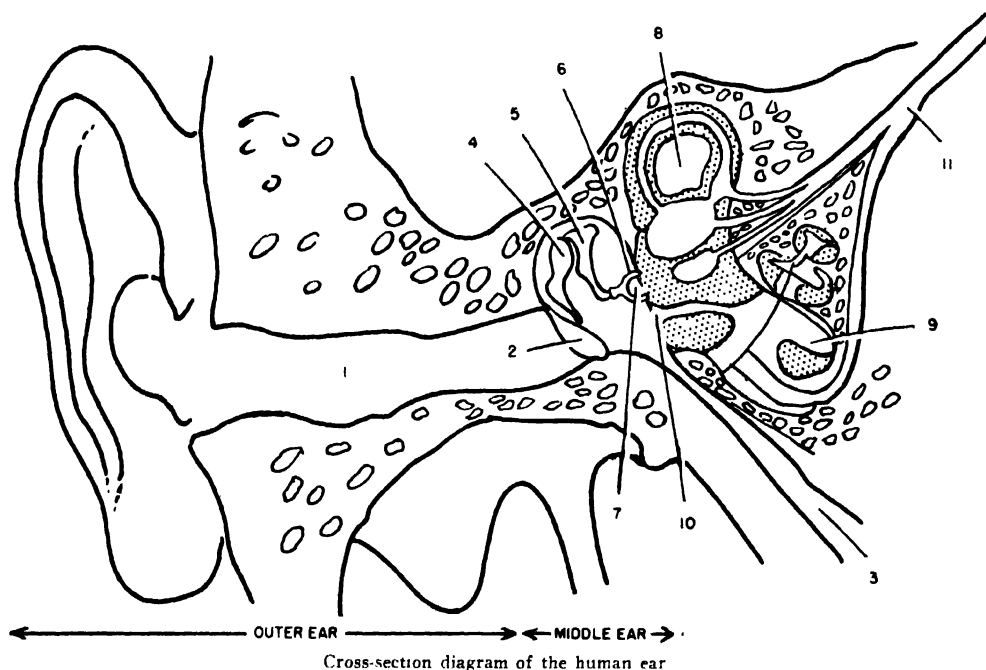
How We Hear.—Sound waves are produced

by any object vibrating in a medium such as air or other matter. (See ACOUSTICS.) The pitch of the sound is determined by the number of times the object vibrates each second. The more rapid the vibration, the higher the pitch; and the less rapid the vibration, the lower the pitch. The human ear hears vibrations starting at about 20 times per second and going up to about 20,000 times per second. Average human speech ranges from about 250 to 4,000 vibrations per second; therefore that is the most important area in our hearing. The extent of each vibration determines the loudness or dimness of a given sound, the larger vibrations producing louder sounds, and vice versa. Sound as we know it is made up of different pitches and degrees of loudness. In music this combination is generally pleasing to the ear; unpleasant combinations are referred to as noise.

The accompanying sketch contains a diagram of the human ear. The ear is divided into three

(5), and the stirrup (6) because of their respective shapes. The footplate of the stirrup is oval in shape and fits into a window called the oval window (7) which connects with the inner ear. The inner ear is made up of a great number of lymph-filled canals in solid bone. These canals are in two different shapes. One is a set of three half-circles, known as the semicircular canals, the six ends of which meet in a common space; this group of canals is known as the vestibule (8). The other group of canals resembles a snail shell and is known as the cochlea (9).

It is impossible to compress the lymph in these canals. When the footplate of the stirrup tends to press into the oval window there must be a way for this fluid to move, and this is provided by a small round window covered with a delicate membrane located at (10). As the footplate goes in and out, the membrane over the round window goes out and in, thus setting up



parts: the outer ear, the middle ear, and the inner ear. Sound waves are caught by the auricle—that part of the outer ear which sticks out from the side of the head—and are reflected into the ear canal (1). They then strike against the ear drum (2) and set it vibrating.

The space to the right of the ear drum, known as the middle ear, contains air. In the normally functioning ear the pressure of the air in this middle ear is at all times equal to the air pressure on the outside. This is made possible by the Eustachian tube (3) which connects with the back part of the nose. Ninety per cent of the time this tube is collapsed like a fire hose rolled up in a fire truck; but it opens up when we swallow or yawn, and in that way the air pressure is equalized.

The vibration of the ear drum sets up a vibration in the chain of three small bones which carries these impulses across the middle ear. These bones are called the hammer (4), the anvil

waves in the lymph. These waves move the tiny nerve endings in the cochlea (9), producing nervous stimuli which are carried through a branch of the auditory nerve (11) to the brain where the mind transforms them into hearing. The function of the three semicircular canals (8) is to respond to movements of the head. Tiny nerve endings in the rounded ends of these canals are stimulated by these movements and transmit messages through the other branch of the auditory nerve to the brain. (See also EAR.)

Types of Deafness.—There are two main classifications of deafness. The first to be considered is congenital deafness, as in the person who is born deaf. The other type is acquired deafness, or deafness which is developed after birth.

Congenital Deafness.—This type of deafness may be further classified as: (1) hereditary; (2) secondary, due to malformations of the external or middle ear; (3) due to occurrences in

the mother during the first three months of pregnancy; (4) due to accidents to the unborn child while in the uterus; and (5) due to injuries occurring during birth. Any of these types of congenital deafness may be complete or total, nearly total, or partial, and they may involve one or both ears.

Of the hereditary types, the most frequently found cases are those which follow the Mendelian theory of heredity. If the deafness occurs in several children from the same father and mother, it is usually a dominant characteristic in both of the parents. If it occurs in some but not all of the children, it is usually a dominant characteristic in only one of the two parents. If it occurs in only one child with several normal-hearing children from the same parents, it is usually a recessive characteristic in one of the parents. As a consequence of these tendencies, there are many hereditarily deafened children born when there is no history of hereditary deafness in the usually known three generations of ancestors of the two parents. In all cases of hereditary deafness, the improper development is located in the hard bony part of the inner ear. There is no known medical or surgical treatment for this kind of deafness. Although such cases constitute a small part of 1 per cent of all cases of deafness, there are about 2,000 hereditarily deaf children born in the United States every year. In nearly all of them the deafness is total or subtotal.

Since the natural acquisition of speech in a child occurs in direct ratio to the extent of hearing ability, the development of speech in cases of hereditary deafness requires extensive and lengthy training (see below under *Education of the Deafened*). This situation gave rise in former years to the commonly used expression "deaf and dumb," whereas actually there is the same percentage of low mental capacity among hereditarily deaf children as among normal-hearing children. Although there is no known medical or surgical treatment for this kind of deafness, it is incorrect to suppose that nothing can be done for children thus afflicted. Many ethical institutions exist where these children may be taught to speak and where they may be educated much the same as a normal-hearing child.

A few children are born with malformations of the external ear or middle ear or both, in whom there is no evidence to support the idea that these cases are of a hereditary nature. The amount of deafness in such cases depends on the extent of the malformation and whether it involves both ears. Several types of surgical procedures have been proved successful in these cases. One type of surgery is directed toward the improvement of hearing. Because of the delicacy and extensiveness of this type, it is usually resorted to only when the malformation of the ear canal and middle ear involves both ears. When it involves only one ear, the overall hearing deficiency is not of too significant extent. The other types of surgery in these cases are directed toward giving the auricle a more normal appearance. This is true plastic surgery, and although there is no tangible improvement in the hearing as a result of this work, the psychological benefit is very great in many instances. The art of making a prosthetic auricle from latex rubber has developed to such an extent that the artificial auricle is frequently indistinguishable from a normal auricle.

The third type of congenital deafness is that which occurs as a result of some illness such as rubella (German measles) in the mother during the first three months of pregnancy. The resulting deafness is apt to be rather severe if an illness occurs between the sixth and eighth week of pregnancy when the important parts of the inner ear are being developed in the unborn child. This condition may also result from the mother's taking large doses of certain drugs, particularly quinine, at this period in the pregnancy. Although not as frequently nor as positively as in the case of German measles, some of the other virus diseases such as regular measles, mumps, chicken pox, or infantile paralysis in the mother at this time of pregnancy may also produce a deafened child. The deafness in all cases of this category is associated with the nerve or inner ear, and there is no known medical or surgical treatment of proved value.

Accidents of a mechanical nature which happen to the unborn child during the last two or three weeks of pregnancy may also result in deafness. These are rather rare and are most often associated with other sensory or mental disturbances because they are caused by a diminished blood supply to the brain of the child, which is not sufficient to cause death. Again there is no treatment for this type of congenital deafness.

Injuries to the head of the child during actual birth may also produce a permanent deafness. Fortunately the incidence of this type of congenital deafness is rapidly diminishing because of improvements in obstetrics.

Acquired Deafness.—Although this type constitutes over 99 per cent of all cases of deafness, it is very seldom as severe as congenital deafness. Moreover it usually comes after the child has developed speech, thus eliminating one of the big problems in congenital cases. Fortunately, too, the vast majority of acquired cases are responsive to either preventive or restorative treatment.

A large percentage of acquired cases of deafness, particularly in children, are known medically as otitis media. This means any infection in the middle ear which formerly was often called a "bealed ear." Practically all infections in this area are caused by bacteria being forced into the middle ear through the Eustachian tube; exceptions occur in cases of scarlet fever, measles, chicken pox, and injuries or burns of the ear drum. The forcing of bacteria up the Eustachian tube is nearly always caused by blowing one's nose or diving while swimming. When infection in the middle ear occurs before the age of two, it usually means that the tube is unusually short.

In cases of scarlet fever, measles, and chicken pox, the infection gets into the middle ear through the bloodstream. Therefore, there are only two ways to avoid ear complications in these cases: avoid exposure to these diseases, and keep children who have had one of the diseases in bed for a few days after they want to get up and around. In cases of injury to the ear drum as the result of an accident, bacteria may be introduced into the middle ear from the ear canal. One should not irrigate the ear canal or use ear drops when the ear drum is torn.

Chronically infected tonsils and adenoids, particularly the adenoids, may also cause infections in the middle ear. In some instances,

large adenoids without infection can block the Eustachian tube and reduce hearing. If there is only a slight possibility that the tonsils and adenoids may be the cause of trouble, they should be removed surgically. Occasionally adenoid tissue is so close to the opening of the Eustachian tube that it is impossible to remove it without injuring the tube itself. In such cases it is necessary to destroy the adenoid tissue by X-ray, but this should never be tried until adequate surgical measures have been performed.

Another large percentage of cases of acquired deafness are due to what is known as "nerve deafness." This term is not completely accurate; rather, the condition should be termed inner ear deafness. This means that the cause of the poor hearing is located in either the cochlea or the auditory nerve, or further in the brain. In nearly all cases of inner ear deafness, the higher pitches are depressed more than is the lower end of the range of hearing. However, because this condition may exist in a few cases of deafness other than inner ear deafness, one cannot make an accurate diagnosis on this basis alone.

As one grows older there is a slight amount of progressive inner ear deafness—and a consequent loss of some of one's ability to hear the higher pitches—that must be considered normal. This normal high-pitch loss may be exaggerated due to toxic absorption from some infected focus such as teeth, tonsils, sinuses, or prostate.

No positive method of restoring hearing lost as a result of so-called "nerve deafness" has been discovered. The elimination of a focus of infection and the use of certain vitamins may prevent further loss.

Another type of inner ear deafness is the so-called "traumatic deafness." We know that prolonged subjecting of one's ears to certain types of loud noises can produce permanent inner ear deafness. Many types of ear plugs have been devised to protect one against this type of injury, but none of them is completely satisfactory.

Nerve deafness may occur as the result of meningitis or severe mumps at any age. It may also occur as the result of a hemorrhage in the inner ear. These nerve deafness cases occur rather rapidly as compared with the previously discussed nerve cases which develop over a period of several years. Seldom do these sudden cases become worse if they are not complete, and it is only rarely that hearing improves subsequently to any appreciable extent.

Another type of acquired deafness is caused by otosclerosis. Although the tendency to this disease may be inherited, the deafness itself never develops until several years after birth. It is the cause of the vast majority of cases of deafness that become apparent between the ages of 15 and 55. Much research has been directed towards this disease and many facts have been learned. We know what occurs and where it occurs, but we do not know why it occurs. It produces a bony change in the cochlea, and in a great majority of cases this change is manifested as new bone growth around the oval window which inhibits free movement of the stirrup, thus reducing hearing. Attempts have been made to remove this bony growth, but they only served to make the bone grow faster.

It has been learned that otosclerosis occurs about eight times as frequently in the female as in the male, and a positive history of there being a family tendency is obtained in about 65 per

cent of the cases. Many cases have been reported where there is definite evidence that this tendency has skipped one and sometimes two generations. A pregnancy can hasten the progress of this disease, as evidenced by the symptoms of deafness becoming apparent or made appreciably worse if the deafness has been established. About 25 per cent of female otosclerotics can go through a pregnancy without their hearing being made worse. Therefore, avoidance of another pregnancy in a case where this has proved to have been a factor is the only preventive measure for combating the disease.

There is no specific treatment known for otosclerosis. In some cases there is a variable amount of associated nerve deafness. If the nerve deafness is of an appreciable amount, one of the two known methods of improving hearing is precluded, namely, the fenestration operation, the other method is the use of a properly fitted hearing aid.

The Fenestration Operation.—Early in the 20th century, an Austrian doctor (Robert Barany) and an English doctor (G. J. Jenkins) suggested the idea for this operation. In the late 1920's and early 1930's, a French doctor (Sourdille) and a Swedish doctor (Holmgren) developed the operation and performed it on human beings. In the late 1930's, an American doctor (Julius Lempert) improved the procedure and made it practically useful.

The operation derives its name from the Latin *fenestra* which means window. It consists of creating a new window in one of the semi-circular canals to take the place of the oval window whose function has been diminished by otosclerosis. This operation in no way treats the disease of otosclerosis in this or the opposite ear; it is simply a method of detouring the sound waves around an obstruction.

There are no age limitations to this operation. The indications are that the patient has a bilateral hearing loss of more than 20 per cent in his better ear, and that the function of the inner ear is nearly normal. Therefore, it is obvious that the length of time that the hearing impairment has existed is of no major importance, but it has been found that a great majority of persons over 50 years of age who have had deafness for any appreciable time do not have enough inner ear hearing to warrant this operation.

The operation is never done on both ears at the same time. When inner ear tests show that the nerve function is good enough to warrant this operation, it is usually equally good in both ears. In a majority of these cases, however, the air conduction hearing is poorer in one ear than in the other. In such cases, the poorer ear is selected for operation. When the air conduction hearing is about the same in each ear, the selection of the ear to be operated is made on such considerations as the patient's occupation, his use of a telephone, etc. If, after one year from the first operation, the patient desires to have the other ear operated, this may be done.

Hearing Aids.—A hearing aid is an electrical instrument which amplifies sound waves. On March 10, 1876, Alexander Graham Bell first transmitted the spoken word over a wire; thus his invention of the telephone grew out of his attempts to develop an electrical hearing aid. From this first voice-transmitting apparatus there have been developed a great many electrical

sound-transmitting and sound-detecting devices, but of particular interest here is the development of the electrical hearing aid. The first of these was of the carbon or telephone type, in which the range of audible sounds was limited; in other words, it was of relatively poor fidelity. It also needed bulky and relatively heavy battery equipment. The next big step was the development of a vacuum tube small enough for a wearable hearing aid. This increased the fidelity to a considerable extent, but the battery problem was still present because with this method there were needed two types of batteries instead of one. Then came the development of the individual or custom-made ear piece to conform with the various sizes and curves of the auricle and ear canal. This increased the efficiency of the wearable hearing aid to a considerable extent.

The next developmental step came as a result of World War II. The proximity fuse devised during that war required a very small but powerful battery, and the mercury cell "A" battery was developed, along with a tiny but powerful "B" battery. These were then incorporated in a very small one-piece hearing aid. Along with these improvements in the wearable hearing aid, the larger and more powerful group hearing aids have been improved until we now have aids that can deliver amplification up to the limit of human tolerance with a minimum of distortion. All of these technical improvements have increased the ability of teachers to educate and develop speech in the partially or sub-totally deafened child.

As a general rule, a person needs better hearing when the hearing in his better ear falls below 80 per cent. This depends somewhat on the patient's occupation. For instance, a teller in a bank would need help before this point is reached, while a machinist might get along rather well with an even greater loss of hearing.

The hearing aid differs from the public address amplifier in that the loud speaker is close to the hearer's ear rather than out in the open; and the microphone is open to pick up all sounds, as contrasted to one speaker's voice as in the case of a public-address microphone. If this difference is not properly explained to the prospective wearer of a hearing aid, he is apt to be discouraged at the noises his ear receives. Moreover, no hearing aid will select for the wearer what he wants to hear.

It is well for the person with a hearing aid to consider himself as the center of a hearing circle. The normal-hearing person, for instance, may be listening to something 40 feet in front of him, while at the same time a sound of equal intensity 40 feet behind him is of no interest to him. He has trained his mind to ignore the sound behind, although his ears hear it equally well. As one's circle of hearing gets smaller and smaller it becomes less and less necessary to ignore mentally these unwanted sounds. When a properly fitted hearing aid is put on a deafened person, his hearing circle enlarges and he hears these unwanted sounds again. This is very disturbing at first. If he is told that he will have to learn over again how to ignore these sounds, and that this training takes some time, the new purchaser will be much happier with his aid.

In order that a person who has been advised to obtain a wearable hearing aid may get the best aid for his needs, many civilian hearing aid advisory bureaus have been developed. In these bureaus a person can get a properly fitted ear

piece for his particular ear. With this ear piece—which fits all of the commercially made hearing aids—he then may try several of the hearing aids that are best for his particular type of hearing defect. After considering the results of scientific tests and his personal likes, he then may select the aid that will do the best job for him. He is finally referred to the sales organization that will sell him that aid.

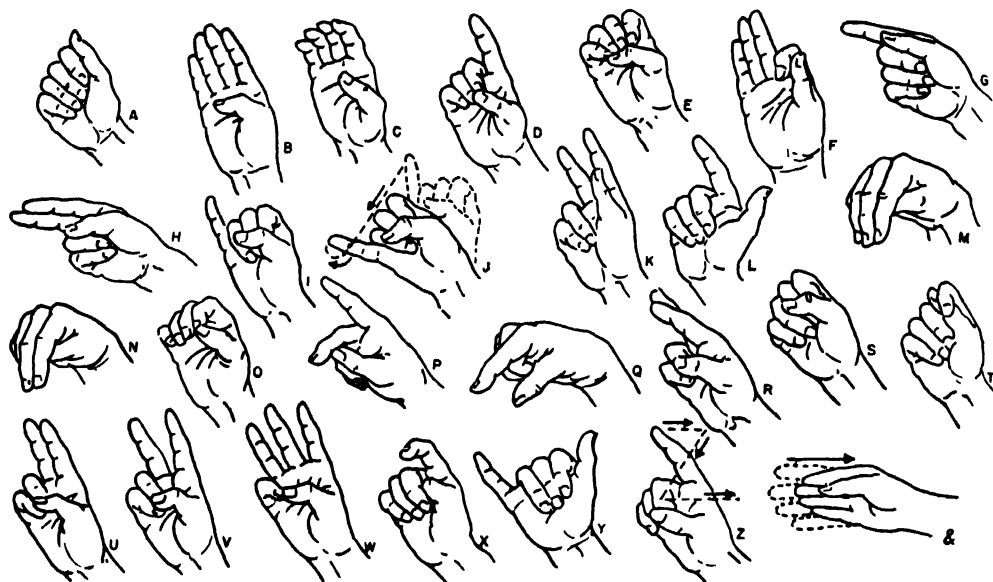
Education of the Deafened.—The historical background of the problem of educating the deafened is very interesting. Although religious and other old writings reveal that congenital deafness with its resulting speechlessness was recognized in the time of Aristotle, it was not until the middle of the 16th century that much was done about it. At that time an Italian physician, Girolamo Cardano (1501–1576), proposed, in *De Surditate* and *Paraphomemon*, that the deaf could be taught to comprehend written symbols by associating them with the object or pictures of the object they were intended to represent. To this day, the association of meaningful language with experience is the keystone of techniques for teaching the deaf.

About the middle of the 18th century there were developed two schools of instruction for the deaf. Abbé Charles Michel de l'Épée (1712–1789) established a school in Paris (about 1770) in which the sign or manual language was the method used to teach communication to the deaf. At about the same time (1778), Samuel Heinicke (1727–1790) established a school for the deaf and dumb at Leipzig, Germany; but in contrast to Abbé de l'Épée, he advocated speech and speech reading, which is known today as "oralism." These two men should be remembered for their recognition of the fact that deaf children can be educated. The controversy between their two methods of instruction spread over Europe and to the United States where, unfortunately, it still exists today.

In 1815, a young divinity student, Thomas Hopkins Gallaudet (1787–1851) of Hartford, Conn., went to England to study the oral method of teaching the deaf as practiced by the Braidwood family. As was the custom of those times, the Braidwoods were reluctant to divulge their secrets to this young man; he therefore went to Paris at the invitation of Abbé Sicard, a French priest, where he learned the manual or sign method as developed by Abbé de l'Épée. He returned to Hartford in 1816 with one of Abbé Sicard's best pupils, Laurent Clerc, and started the first free school for the deaf (first known as Connecticut Asylum, later as American Asylum, and now as the American School for the Deaf) in the United States. The present Gallaudet College in Washington, D.C., formerly the National Deaf-Mute College, was named for this pioneer in 1893.

Although the school at Hartford that was started by Gallaudet in 1817 depended on private funds for its support, it soon became necessary to obtain public funds in order to expand its work. This, then, was the forerunner of the great modern system of state-supported schools for the deaf.

The New York Institution for the Deaf was opened in 1818; a school for the deaf in Philadelphia, begun by David Seixas, was chartered in 1821; the Kentucky Asylum, at Danville, Ky., was opened in 1823; and in the next half-century, schools were established in many of the states.



The American Manual Alphabet for the Deaf.

Most of the earlier schools used the manual method in their teaching.

Alexander Melville Bell (1819-1905) and his son, Alexander Graham Bell (1847-1922), who founded the Volta Bureau in 1887, were both pioneers in the education of deaf children by the visual speech method now known as "oralism." Among the first oral-method schools established after 1850 were the Clarke School for the Deaf at Northampton, Mass.; the Institution for the Improved Instruction of Deaf-Mutes, New York City, founded in 1867 by Isaac and Hannah Rosenfeld (renamed in 1934 the Lexington School for the Deaf); and the Central Institute for the Deaf at St. Louis, Mo., founded in 1914 by Dr. Max A. Goldstein. These and other schools provide excellent facilities not only for the teaching of the deaf, but also for the training of teachers of the deaf.

From the middle of the 19th century to the present day there have been many organizations whose fundamental aim has been the improvement of the sociologic and economic lot of persons with variable degrees of deafness.

It may be of interest to the parents of deaf children to repeat here a helpful list of "do's" and "don'ts" which has been published by the Cleveland (Ohio) Hearing and Speech Center.

DO

1. Accept your deaf child as he is and love him for what he is.
2. Make him feel that he is loved and wanted and not different.
3. Take time to understand what he wants and to let him understand you.
4. Explain to relatives and friends that he is deaf, and interpret his skills and abilities.
5. Have the light on your face when you talk to your child.
6. Get down to the child's eye level when you talk to him.
7. Talk, talk, talk, talk to him.
8. Bring him for special help as early as you realize he has a hearing loss.

DON'T

1. Let your deaf child ever feel that you are ashamed of him or don't want him.

2. Lose your temper with your deaf child.
3. Hide his disability from friends and relatives.
4. Turn your back to the window or lamp when you talk to your child.
5. Shout at your child from a distance and be annoyed because he does not understand.
6. Neglect to talk to your child because you think he does not understand anyway.
7. Put off beginning his education because you think there is plenty of time.
8. Interrupt your child's speech to correct a pronunciation.

In the author's opinion, concerning the controversy over educating a deaf child by the manual method or the oral method, the same method of handling every case has no more merit than it has in solving the many varied problems in the field of medicine, sociology, or economics. All deaf children should have the opportunity of being educated by the oral method. Because the mental capacity and the "will to win" varies in these children as it does in normal-hearing children, there is a small percentage of deaf children who should be taught by a combined method, employing the useful features for the particular case in each method. There is a still smaller percentage of deaf children who should be subjected to the manual method alone. This also is true in the case of the partially deafened child or adult. One should never depend on a hearing aid alone or on lip reading and auditory training alone. A correct combination of both will always produce better results than will one method alone.

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CHARLES E. KINNEY, M.D.,

Otologist, Cleveland Public and Parochial Schools.

DEAK, dē'āk, **Ferencz**, Hungarian statesman: b. Söjtör, Zala, Hungary, Oct. 17, 1803; d. Budapest, Jan. 29, 1876. Having studied law at Raab, he practiced for some time as a barrister, but his political career began with his election to the national Diet in 1832. He soon became, in spite of his loyalist and conservative tendencies, a prominent member of the liberal opposition. He was particularly desirous of preserving Hungarian nationality intact and of improving internal conditions. At the revolution of 1848 he became minister of justice under Lajos, count of Batthyány, and advanced a scheme for the reorganization of the administration of justice which did not materialize owing to the pressure of events. He did his best to avoid the break with Austria, and retired when the Committee of Defense was formed and Lajos Kossuth obtained power. He tried to negotiate peace with the Austrian commander in 1848, but terms could not be agreed upon. On the defeat of the patriots in 1849, he retired from public office and did not return till 1860. He led the Diet of 1861, where he formulated the address to the emperor stating the Hungarian demands for constitutional rights. The Diet was immediately dissolved by the emperor, but Deák did not give up the project. It was not until after the war between Austria and Prussia that these demands were granted and Deák's hopes for a dualistic constitutional monarchy were realized. Deák refused to accept any honors, but remained in the Diet until his death, working patiently and consistently for the unity of Hungary and jealously guarding its rights and liberties. Great praise has been given him for his generosity, simplicity, and sincere patriotism. His statesmanship was marked by clarity of vision and lofty unselfish devotion to his country.

DEAKIN, dē'kin, **Alfred**, Australian statesman: b. near Melbourne, Victoria, Aug. 3, 1856; d. Sydney, New South Wales, Oct. 8, 1919. He was educated at Melbourne University; was minister of public works and water supply, 1883-1886; solicitor general, 1885; chief secretary, 1886-1890; member of Federal Council, 1889-1895, 1897-1899; attorney general of the Commonwealth of Australia, 1901-1903; and prime minister, 1903-1904 and 1905-1908. He published *Irrigation in Western America* (1885); *Irrigation in Egypt and Italy* (1887); *Irrigated India* (1892); *Irrigation in Australia* (1893); *Temple and Tomb* (1894).

DEAL, in the United States, a plank 12 feet long, 11 inches wide, and $2\frac{1}{2}$ inches thick. Deals are sawed of other sizes, but are reduced to that cubic dimension in computing them. The name deal is applied in Europe to boards of fir above seven inches in width and of various lengths exceeding six feet. If seven inches or less wide they are called battens, and when under six feet long they are called deal-ends. The usual thickness is three inches and width nine inches. The standard size, to which other

sizes may be reduced, is $1\frac{1}{2}$ inches thick, 11 inches wide, and 12 feet long. Whole deal is deal which is $1\frac{1}{2}$ inches thick; slit deal is half that thickness. Deals are exported from many parts of Europe and the American continent. In the timber trade, 50 cubic feet of deals are a load, and 100 feet superficial are a square.

DEALFISH, deep-sea bony fishes of the genus *Trachipterus*, allied to the oarfish and the ribbonfish. As the name suggests, the elongated body is laterally compressed; and with the exception of a small separate elevated anterior portion, the dorsal fin is continuous along the back. The anal fin is absent. The tail fin is peculiar in being sharply turned upward. The skeleton is very fragile. Some eight species are known from specimens accidentally thrown ashore on European coasts and from the west of South America.

DE AMICIS, **Edmondo**. See **AMICIS**, **EDMONDO DE**.

DEAN, dēn, **Amos**, American jurist: b. Barnard, Vt., Jan. 16, 1803; d. Albany, N. Y., Jan. 26, 1868. He early acquired eminence in his profession, and after serving as professor of medical jurisprudence in the Albany Medical School and of law in the Albany Law School, became chancellor of the University of Iowa in 1855. Among his published works are *Lectures on Phrenology*; *Manual of Law* (1838); *Medical Jurisprudence* (1854); *Bryant and Stratton's Commercial Law* (1861); *History of Civilization* (1869-1870); *The British Constitution* (1883).

DEAN, **Bashford**, American zoologist: b. New York, Oct. 28, 1867; d. Battle Creek, Mich., Dec. 6, 1928. Educated at the College of the City of New York and at Columbia University, he was instructor in biology at Columbia after 1891 and was professor of vertebrate zoology after 1904. He was also biologist and special investigator of the United States Fish Commission in 1900-1901. He became a member of the advisory board of the New York Aquarium in 1902, curator of herpetology and ichthyology at the American Museum of Natural History (1903-1910), and curator of arms and armor at the Metropolitan Museum of Art (1906-1927). In 1925 he was made professor of fine arts at New York University. He published *Fishes, Living and Fossil* (1895); *Bibliography of Fishes*, 3 vols. (1916-1923); and numerous papers on palaeichthyology. Works on arms and armor include *Handbook of Arms and Armor, European and Oriental, Including the Riggs Collection* (1915); *Notes on Arms and Armor* (1916); and *Helmets and Body Armor in Modern Warfare* (1920).

DEAN, **John Ward**, American author and genealogist: b. Wiscasset, Me., March 13, 1815; d. Medford, Mass., Jan. 22, 1902. He was educated in the public schools of Portland, Me., learned the bookbinding trade, and conducted a bookbinding business in Boston for many years until his appointment in 1872 as librarian of the New England Historic Genealogical Society. Except from 1889 to 1893, he filled this position until his death. He was editor of the *New England Historical and Genealogical Register*, and of nine volumes of the *New England Biblioplist* (1880-1898). Among his writings are

numerous biographical memoirs, including the 'Memoir of Nathaniel Ward' (1868); 'Memoir of Michael Wigglesworth' (1871) and the 'Story of the Embarkation of Cromwell and his Friends for New England.'

DEAN, in ecclesiastical language, a church dignitary presiding over the chapter of a cathedral. The word is from the French *doyen* and from the Latin *decanus*, one set over 10 (*Gr deka*, Lat. *decem*, 10). Originally *decanus* was the designation of a petty civil functionary; its ecclesiastical use had its rise in monachism, where a *decanus* was named to be chief and monitor of 10 monks or 10 hermits; and the senior *decanus* of a *cænobium* served as head of the monastic community in the absence of the abbot. From the institution of canons regular, serving in the chapters of cathedral churches, came the usage of naming the chief among the canons of a chapter as its dean. Rural deans are parish priests who, appointed by the bishop, exercise a certain jurisdiction and supervision over the churches or congregations and their rectors within a definite district in a diocese. In the Curia Romana, the dignitary styled Cardinal Dean of the Sacred College is the chief among the cardinals and is usually the oldest of the seven cardinal bishops: he succeeds his predecessor in the see of Ostia. From ecclesiastical usage the term dean was adopted as designation of the leading member of various secular bodies, for example, the head of a university faculty, or a college, or of a guild. The deans in German cathedrals are subordinate to the provosts; they are appointed by the bishop usually, but sometimes by a sovereign or chapter. In the Church of England some of the deaneries are valuable benefices. A dean may hold one other living along with his deanery. He is bound to reside eight months of the year at his cathedral. The bishop of London holds the honorary office of dean of the chapel royal, and there is also a sub-dean and chaplains. Rural deans are beneficed clergymen appointed by the bishop or archdeacon to exercise jurisdiction in certain matters in some part of the diocese. This office had fallen into disuse, being superseded by the appointment of archdeacons, but has latterly been revived. The rural deans hold office during the life of those by whom they are appointed. There are also a few deans called deans of peculiars, who exercise an independent jurisdiction, and are not under a bishop. In Scotland the honorary title of dean of the chapel royal is bestowed on a clergyman of the established church, and six chaplains are also appointed to a similar honorary office. Deans of colleges are, in English universities, officers appointed to superintend the behavior of the members, and to enforce discipline. In the universities of Scotland and elsewhere the head of each of the faculties of law, theology, medicine, science, etc., is called dean of the faculty. In universities in the United States the dean of a department is the registrar or secretary, and in some institutions he has considerable to do with the discipline. The dean of guild in Scotland is a burgh official whose duty it is to see that buildings are erected in accordance with the municipal regulations.

DEANE, Charles, American antiquarian: b. Biddeford, Me., 10 Nov. 1813; d. Cambridge, Mass., 13 Nov. 1889. He was for many years a

merchant in Boston but retired from business in 1864 and devoted himself to the collection of works relating to American history. He edited 'Bradford's History of Plymouth Plantation' (1856); 'Wingfield's Discourse of Virginia' (1860) and John Smith's 'True Relation,'

DEANE, Silas, American diplomatist: b. Groton, Conn., 24 Dec. 1737; d. Deal, England, 23 Aug. 1789. He was graduated at Yale College in 1758, and was a member of the first Continental Congress in 1774. He was sent by Congress to France as a political and financial agent, with instructions to ascertain the temper of the French government concerning the rupture with Great Britain, and to obtain supplies of military stores. But he did not confine himself to his instructions, and made promises and engagements on all sides, which afterward brought the Congress into considerable embarrassment. When it was determined to send ministers to negotiate treaties, Dr. Franklin and Arthur Lee were commissioned to join him at Paris, and he assisted in the negotiation of the treaty with France. In consequence of the extravagant contracts he had entered into, he was recalled 21 Nov. 1777, and John Adams appointed in his place. He left Paris 1 April 1778, and upon his return, being called upon to give an account of his proceedings on the floor of Congress, evaded a complete disclosure on the ground that his papers were in Europe. He then attacked his fellow commissioners and Congress itself in a public manifesto for the manner in which he had been treated, but did not succeed in removing the public suspicion from himself. Later his lack of sympathy with the American Revolution increased the animosity of his fellow citizens. He afterward published in 1784 'An Address to the Free and Independent Citizens of the United States' on the same subject, and returning to Europe, died in great poverty. It was not until 1842 that Congress succeeded in adjusting his case and discovered its financial indebtedness to the supposed mismanagement of Deane. About \$35,000 was subsequently paid to his heirs. Consult Ingraham, E. D. (editor), 'Papers in Relation to the Case of Silas Deane' (1855); Clark, George Larkin, 'Silas Deane, a Connecticut Leader in the American Revolution' (New York 1913).

DEANS, Jeanie, the heroine of Sir Walter Scott's tale, 'The Heart of Midlothian.' When her sister Effie was sentenced to death for the murder of her own child, Jeanie went on foot to London and obtained from the queen a pardon for her sister. Her devotion forms a contrast to the attitude of the father, David Deans, whose rigid sense of justice leads him, in spite of the dictates of his heart, to drive Effie from his door. Effie is married to her lover and becomes a lady of the court.

DEARBORN, Henry, American soldier: b. Hampton, N. H., March 1751; d. Roxbury, Mass., 6 June 1829. He was practising medicine at Portsmouth when, on hearing the news of the battle of Lexington, 20 April 1775, he immediately marched with 60 volunteers, and was at Cambridge early the next day, a distance of 65 miles. He was made a captain, was at the battle of Bunker Hill 17 June, and accompanied Arnold on the expedition through the woods of Maine to Quebec. He served as major under Gates at the capture of Burgoyne, and distin-

guished himself and his regiment by a gallant charge at the Battle of Monmouth in 1778. In 1779 he served in Sullivan's expedition against the Indians, in 1780 with the army of New Jersey, in 1781 at Yorktown, and in 1782 was on garrison duty at Saratoga. He was twice member of Congress, and for eight years, during the presidency of Mr. Jefferson, secretary of war. In 1809 he was made collector of Boston, and on Jan. 27, 1812, became senior major-general in the United States army. Resigning his commission in the army in 1815, he was appointed May 7, 1822, minister to Portugal, where he remained two years, and was recalled at his own request.

DEARBORN, city, Michigan, in Wayne County; traversed by the Rouge River, which reaches its confluence with the Detroit River near by; adjoining Detroit on the southwest and 9 miles by rail from the heart of that city; served by the Michigan Central; Pennsylvania; and Detroit, Toledo and Ironton railroads. Dearborn, situated next door to Detroit, is nevertheless an independently incorporated city, whose rapid growth has brought it to meet its great neighbor Detroit at Wyoming Avenue, which forms the dividing line between the two cities. Dearborn reaches from Wyoming Avenue to Gulley Road, the township line, about seven miles to the west; and its remaining city line is irregular but encompasses an area of approximately 25 square miles.

The city is largely residential in character, and it has two thriving business sections; but it is chiefly famous as the home of the Ford Motor Company, which was removed here from Highland Park soon after World War I. Besides the automobile industry, manufactures include tools, dies, bricks and road-paving materials. There is a considerable greenhouse business, and in the vicinity are coal deposits. There is an excellent school system, augmented by the Henry Ford Trade School, which operates on the theory that students learn more rapidly from actual experience than through other methods, and provides one instructor to every six students, a system that has been adopted for trial in several other states. Points of interest are the Ford Rouge Plant; the birthplace of Henry Ford (q.v.); the Haigh House, built about 1833 by Col. Joshua Howard of the United States Army; the remains of the old Detroit Arsenal; the Edison Institute of Technology, with its Edison Museum and exhibits; and Greenfield Village with its priceless collection of historic buildings centered around a village green, has a museum exhibiting the tools and utensils of other days, the Cotswold cottage group from England, and Menlo Park, the laboratory of Thomas A. Edison.

The region had its first influx of settlers soon after the War of 1812. The township of Dearborn, first called Pekin, was re-named in honor of Gen. Henry Dearborn (q.v.). The village, named for its township, grew slowly, having attained a population of 911 in 1910, and 2,470 in 1920, but the following decade, with the growth of the motor industry, saw its phenomenal growth to 50,358 in 1930, and 63,584 in 1940. Meantime, in 1927, it was incorporated as a city and made independent of Dearborn Township, and in 1929 it annexed Fordson. The latter was the former Springwells township, which was incorporated as a city in 1923, and had its name changed to Fordson in 1925. Pop. (1950) 94,994.

DEATH, in common language, a state opposed to life, and considered as the cessation of it. Strictly speaking, we can trace only the cessation of organic life. The matter of which the body is composed does not perish on the death of an organized being; it undergoes various changes, which are known by the names of decay and putrefaction, and which are the preparation for its becoming subservient to new forms of life. Putrefaction is much influenced by external circumstances, particularly air, heat and water. In very dry situations the body is converted into a mummy, in which state bodies are found in the arid deserts of Africa, and on the mountains in Peru. Some vaults are remarkable for preserving corpses from putrefaction. It is well known to every reader that particular substances counteract putrefaction; for instance, those in embalming mummies.

The death-agony is the state which immediately precedes death, and in which life and death are considered as struggling with each other. This state differs according to the cause producing it. Sometimes it is a complete exhaustion; sometimes a violent struggle, and very irregular activity, which at last, after a short pause, terminates in death. In some cases consciousness is extinguished long before death arrives; in other cases it continues during the whole period and terminates only with life. The person in this condition has already somewhat the appearance of a corpse: the face is pale and sallow, the eyes are sunken, the skin of the forehead is tense, the nose pointed and white, the ears are relaxed and the temples fallen in; a clammy sweat covers the forehead and the extremities, the alvine discharges and that of the urine take place involuntarily, the respiration becomes rattling, interrupted and at length ceases entirely. At this moment death is considered to take place. This state is of very variable length; sometimes continuing for minutes only, sometimes for days. When the patient is in this condition nothing should be attempted but to comfort and soothe him. As long as the dying person is able to swallow, wine or other cordials may be given from time to time.

Signs of Death.—During death the chief physical processes, such as respiration and circulation, may first cease, but molecular activity may persist for some time, as is evidenced in the common observation of the growth of hair after death. The desirability of knowing the absolute signs of death is due not so much to the danger of burying the living, as to the possibility that efforts at resuscitation may not be adequately performed in cases of apparent death. The idea that at the present time people can be buried alive is more or less absurd; but it is very true that many cases of apparent asphyxia, notably following drowning or electrical shock, are recoverable if proper means to resuscitate them are taken.

There are a number of conditions that simulate death. The commonest of these are catalepsy and trance states, partial asphyxia and syncope or fainting. In catalepsy there is usually a loss of consciousness, the muscles of the body generally become very rigid, but the limbs may be readily moved and placed in various positions. The temperature is lowered, but the respiration and the heart-action, while reduced, are apparent. In trance the appearance of death is much more striking, consciousness is usually abolished, the face is pale, the limbs may be

flaccid, and sometimes are rigid, the reflexes may be lost, and the pupils may be dilated and immobile. The absence of the signs of decomposition, the normal ophthalmoscopic appearance of the fundus of the eye, and the persistence of electrical excitability are sufficient, however, for determining this condition. Partial asphyxia by drowning is one of the most frequent causes of apparent death. Resuscitation has resulted even after a body has been under water for an hour. This fact emphasizes the desirability of continued treatment in all cases of asphyxia by drowning. Ordinary fainting is readily distinguished from normal death.

The special signs of death are those that involve the circulation, respiration, conditions of the muscular system and certain changes in the eye. Circulatory changes are those of stoppage of the heart, with consequent loss of heat and coagulation of the blood. Careful listening to the heart-sounds by means of specially devised instruments may be necessary to determine whether the heart has stopped beating or not, and special methods of applying ligatures to the lobe of the ear or the finger, cutting off the venous return and permitting the ordinary inflow to continue, may be used. The respiratory changes consist of cessation of respiration, with consequent change in the color of the patient, there being marked pallor in distinction usually to marked cyanosis of asphyxia. A mirror placed before the nose or over the mouth will sometimes detect breathing when it cannot be seen or heard; and if a vessel of water be placed over the chest, movements of that organ may be detected. Muscular changes are very characteristic. There is usually complete muscular relaxation, followed by great stiffness (*rigor mortis*) after a certain number of hours. There is commonly loss of excitability of the muscles. Changes in the eye are corroborative rather than unique. The iris is usually flaccid; the pupil is ordinarily moderately dilated and irresponsive to light, and is not reacted upon by atropine or eserine half an hour after death. There is a marked anemia of the fundus of the eye when viewed with the ophthalmoscope.

Finally there are a series of cadaveric changes that result and which are indubitable evidence of death. There is gradual loss of heat, although in certain cases of cholera temperatures as low as 76° F. have been observed, and the patient has still lived. *Rigor mortis* develops, probably, by the action of a ferment resulting in the formation of myosin. This condition may come on very rapidly, sometimes in a few hours, but complete *rigor mortis* rarely takes place within this time. Occasionally there is an instantaneous *rigor mortis*, when death occurs suddenly during violent muscular exertion. This happens in times of war, when weapons are sometimes firmly grasped in the dead hand; and in some cases of drowning the patients may be found with weeds and mud clutched in the fingers. The disappearance of *rigor mortis* usually takes place in from 16 to 36 hours, although there is no absolute rule. Coagulation of the blood, post-mortem hypostases, post-mortem lividities and putrefactive decoloration, with formation of gases, are usually characteristic and unequivocal.

Death in Mythology, etc.—The representation of death among nations in their earlier stages depends upon the ideas which they form

of the state of man after this life, and of the disposition of their gods toward mankind. In this respect the study of these representations is very interesting. Of later ages the same cannot be said, because imitations of representations previously adopted are very often the subjects of the plastic arts in such periods. However, these representations do not altogether depend on the causes above mentioned, as the general disposition of a nation (for instance, that of the Greeks, who beautified every object) has also a great influence upon them. The Greeks represented death as a pleasing, gentle being, a beautiful youth. They personified death under the name Thanatos, while the Kêres were rather the goddesses of fate and violent deaths, like the Valkyrie in the northern mythology. According to Homer, Sleep and Death are twins, and Hesiod calls them the sons of Night. They are often portrayed together on cameos, etc. During the most flourishing period of the arts Death was represented on tombs as a friendly genius with an inverted torch, and holding a wreath in his hand; or as a sleeping child, winged, with an inverted torch resting on his wreath. Sleep was represented in the same manner, except that the torch and wreath were omitted. According to an idea originating in the East, death in the bloom of youth was attributed to the attachment of some particular deity, who snatched his favorite to a better world. It was ascribed, for instance, to Jupiter, or to his eagle, if the death was occasioned by lightning; to the water-nymphs if the individual was drowned, as in the case of Hylas; to Eos or Aurora if the death happened in the morning; to Selene, if at night, etc. These representations were more adapted to relieve the minds of surviving friends than the pictures of horror drawn by later poets and artists. (Consult Herder's 'Wie die Alten den Tod gebildet.') Euripides, in his 'Alkestis,' even introduced Death on the stage, in a black robe, with a steel instrument in his hand, to cut off the hair of his victims, and thus devote them to the infernal gods. The later Roman poets represent Death under more horrible forms, gnashing his teeth and marking his victims with bloody nails, a monster overshadowing whole fields of battle. The Hebrews, likewise, had a fearful angel of death, called Samaël, and prince of the world, and coinciding with the devil; but he removes with a kiss those who die in early youth. The disgusting representations of Death common among Christians originated in the 14th century; for the representation of Death as a skeleton merely covered with skin, on the monument at Cumæ, was only an exception to the figure commonly ascribed to him among the ancients. In recent times Death has again been represented as a beautiful youth—certainly a more Christian image than the skeleton with the scythe. The monument made by Canova, which George IV erected in honor of the Stuarts in Saint Peter's Church at Rome, represents Death as a beautiful youth. He is sometimes portrayed under the figure of a dying lion.

See also MORTALITY; VITAL STATISTICS.

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DEATH, Civil, is the loss during natural life of all civil rights, including the right to own property and the power to perform any legal function. Under early English common law, a person could become civilly "dead" by entering into religious orders, by abjuring the realm, or by banishment or attainer. Under modern law, the drastic deprivation of rights implied by strict civil death no longer prevails, although some jurisdictions provide for a limited civil death for persons sentenced to life imprisonment.

DEATH, Dance of. See DANCE OF DEATH.

DEATH ADDER, one of the more dreaded snakes (*Acanthophis antarcticus*) inhabiting Australia, New Guinea, and some adjacent islands. Superficially it is viperlike in appearance with a relatively broad head and a stocky body. Actually it is a member of the family Elapidae that includes the venomous cobras and their allies. Death adders have short tubular fangs attached at the front of the upper jaws which are not movable to the extent that they are in vipers. Large specimens are about a yard in length. Most other members of the family lay eggs, but the death adder produces living young, as many as twenty in a litter. It is also known as the "deaf adder."

DEATH COMES FOR THE ARCHBISHOP, a novel by Willa Cather (q.v.), published in 1927.

The major theme is the life and missionary labors of a Roman Catholic bishop, Jean Marie Latour, and his close friend and clerical deputy, Father Joseph Vaillant, in the newly created diocese of New Mexico. During the chronicle of their long service in the vast, rugged, and at that time (*circa* 1850) unknown region, the author makes a number of digressions. The main story is intensified by these and rendered more significant by a wealth of effective description, not only of striking scenery and architecture but also of native Mexican, Indian, and American types. The novel has a spirit of esthetic fastidiousness, moral idealism, and religious piety. An element of history is supplied by a portrait of the American frontiersman, Kit Carson, and a description of his house at Taos.

The quality of the novel suggests that it has been slowly distilled rather than contrived. As an example of Miss Cather's mature writing, *Death Comes for the Archbishop* is literary art that has evolved to the point that it conceals itself.

DEATH CUSTOMS AND RITES, the modes of disposing of the deceased and the various rituals and taboos kept during and after disposal. Disposal of the dead is a universal culture trait and is historically closely associated with metaphysical beliefs in the separate existence of spiritual beings (animism). The presence of grave furniture and goods is indicative of animistic beliefs.

Modes of Disposal.—An ethnological survey reveals six basic modes of disposal: inhumation (interment), cremation, conservation (embalming), exposure, water burial, and animal consumption. Two or more of these methods may be combined in a given culture. The manner of

disposal tends to be correlated with the social status, type of death, age, and sex of the deceased and varies with different societies. Cannibalism, where practiced, has symbolic significance as a means of acquiring the virtue or power of the deceased and is usually restricted to the consumption of certain portions of the body and the blood.

According to the historian and anthropologist Vere Gordon Childe, even subhuman Neanderthals who hunted mammoths in Europe some 50,000 years ago interred their dead. They dug a pit in the floor of the cave they inhabited and buried the body in a ritual position, flexed or contracted. With it they placed game, flint knives and toilet articles. In Upper Palaeolithic times both extended and contracted burials are represented. The dead may be decked with necklaces, chaplets, or anklets of perforated shells, and pendants or bracelets of mammoth ivory. In the Mesolithic phase of culture not all the burials come from caves; some are found in encampments in the open, generally in the refuse of the camp. Collective burial in natural caves or in built or rock-cut chamber tombs was practiced by the Mesolithic Natufians in Palestine. Inhumation in a flexed or contracted attitude was almost universal in Neolithic and Early Bronze Age societies. It subsequently began to give place to extended burial. Among Neolithic hunters in the Siberian and north European forest zones and among some Neolithic farming communities in France, northern Europe, and south Russia, extended burial was the rule. Extended burial is fairly closely associated with increasing wealth and superior tools that meant facilities for digging larger graves. There is no evidence that the abandonment of contracted burial was due to a change of belief or of race.

Cremation had a wide vogue at least in Europe and was practiced by Neolithic and Middle-Late Bronze Age societies (from 1400 B.C.) in the British Isles, Brittany, Switzerland, northern and central Europe, and by the Early Iron Age (from 1000 B.C.) in Spain and upper Italy. In the first millennium B.C. both cremation and inhumation were practiced in most Greek and Italic cities. In the Roman Empire cremation at first spread without ousting inhumation, but at the same time some Teutonic tribes were reverting to inhumation.

The converse practice of conserving the remains of the deceased reached its highest development in Egypt. The hot desert sand in which prehistoric corpses were buried acted as a preservative. Mummification was gradually developed after 2500 B.C. first for the pharaoh and his nobles, later for all who could afford the expense. Curiously similar preservative methods were employed by some barbarian tribes as far away as South America and the Pacific.

Neolithic, Early Bronze Age and Early Iron Age societies continued to deposit with the bodies and ashes of the deceased the ornaments, toilet articles, and weapons which they found useful when alive. The grave goods reflect the technical progress achieved. Bronze Age graves contain mirrors, tweezers, razors, pins, metal jewelry, and finally metal weapons. Agricultural implements, such as sickles, though of revolutionary importance in the daily life of the Bronze Age society, are rarely found in graves at any time.

After the Early Bronze Age the grave furniture not only fails to reflect the societies' growing wealth but actually becomes poorer. Among

civilized societies, only the earlier burials in Assyrian cemeteries are well furnished with bronze weapons and ornaments. After 2000 B.C., though the cities were far richer and the houses larger, the graves contain as a rule only a few token ornaments and vases. In Egypt a tendency to replace valuable possessions by cheap models in wood or clay is apparent even in predynastic graves. A similar trend is apparent in classical Greece after 700 B.C. This seems to indicate that in a stable progressive society a diminishing proportion of its goods is buried with the dead. This does not presuppose any immediate change in beliefs about the needs of the dead but rather a changing evaluation of material wealth. In time the new practices were justified by a more spiritual conception of the soul and its future life. With the advance of civilization, as Childe has observed, more care is devoted to the comfort and hygiene of dwelling houses and less to the stability of tombs; funeral rites and mortuary constructions absorb a diminishing proportion of social resources and the life budget of societies.

Among preliterate societies of modern times, inhumation, exposure and cremation tend to predominate. In North America, the Indians of the Plains dressed and painted the corpse, then wrapped the body in a robe and placed it upon a scaffold, in a tree, or upon a hill. None of the Plains tribes seem to have practiced cremation and but few of them practiced inhumation. Government authorities at first experienced great difficulty in inducing modern Indians to inter their dead, as Indians believed that interment would interfere with the passage of the spirit to the other world. According to the anthropologist Clark Wissler, the following modes of disposing of the corpse tend to prevail among the Indians of the United States: flexed burial, sitting burial, extended burial, cremation with urn burial, tree and scaffold burial, house burial, and burial in water. As a rule, each tribe tolerated several forms of burial. Cremation was common in the Pacific area, canoe burial in the Columbia River country, scaffold and tree burial in the Plains. House burial, as in a tepee, or other form of dwelling, was common in the Plains and along the Great Lakes. The mysterious mound builders who inhabited the Mississippi Valley and eastern United States long before the coming of the white man buried their distinguished dead, so it is thought, in small mounds surrounding a great central mound, probably the site of a temple or ceremonial activities.

In primitive African cultures, the ritual surrounding death is long and complex in most places. The main aim is to ensure a proper funeral for the departed, so that his spirit may be contented in the world beyond, and will not return as a dissatisfied ghost. Bodies are usually buried as soon as possible after death owing to the hot climate. As a modern innovation, photographs are often taken of the dead surrounded by his family, the corpse being propped up and dressed in its best for the occasion. At chiefs' funerals human beings might be killed to accompany their lord. Chiefs are buried in royal graves or sacred groves but commoners are often interred in their own houses, under the floor. In South Africa the hut may be destroyed after the funeral or the kraal wall pulled down. After death the corpse is washed, shaved of all hair, and then dressed in the best robes and trinkets and visited by relatives. At the interment vari-

ous objects are put in the graves, such as weapons, tools, tobacco, ornaments, and food, for the use of the deceased on his journey to the world of ancestors' spirits. When the body is placed in the grave, prayers may be made asking the deceased's spirit to give blessing and not harm. Great attention is given to prevent the earth from falling directly on to the body. Formerly winding sheets and mats were used; nowadays coffins are increasingly popular. In addition to the burial there is usually a later ceremony—sometimes called the "second burial"—"to make the grave firm." This ceremony may be performed anywhere from a few weeks to a year or more later, depending upon the expense and the fear of the ghost of the deceased.

In modern civilized societies, inhumation and cremation are the main forms of disposal of the dead. Owing in large measure to the influence of Judaism, Christianity, and the Moslem religion, inhumation has been practiced traditionally in the West in the modern era. On the other hand, Hinduism and Buddhism tend to promote the practice of cremation among their adherents in India, Indochina, Korea, and Japan. The modern Parsis of India, adherents of a form of Zoroastrianism whose ancestors came to India in the 8th century A.D., expose their corpses to vultures on the towers of silence. In one form of disposal in Tibet the flesh is cut from the bones and fed to dogs and birds, but the bodies of grand lamas are embalmed and kept on display for worship. Since the beginning of the 20th century, many European countries as well as the United States, Canada, and Australia, have made statutory provision for cremation.

Mourning Rites.—In primitive cultures, death is understood as a passage into the final stage of existence, just as adolescent rites mark the passage from childhood to manhood. Thus, there is a bond of unity between the living and the dead, the presence of the departed is taken literally. Hence no obligation is more binding than that proper respect be paid to the dead. Propitiation, motivated by fear, is the main objective of all primitive burial rites. Since the presence of the spirits of the dead is not desired, provision is frequently taken to have death occur away from the dwelling—often in a special shelter—in order that the souls of the deceased may not injure those in the regular habitation. Otherwise, if death occurs in the family house, the house may be deserted or even destroyed. Sometimes, as in Africa, a whole village may be deserted upon the death of a great chief.

In the journey to the grave, care is often taken to prevent the soul from returning to the house. Since the ghost is thought to be able to return only by the same route which has been taken, much ingenuity is exercised in preventing its return—the body sometimes is carried through a hole in the roof or through the chimney. Similarly, the soul may be prevented from returning from the burial place by barring its way with fire or water. Among the Hopi Indians of the American Southwest, the hands of the dead clasp a stick which projects from the grave. By means of this the soul escapes to the land of the spirits, just as the people originally ascended from beneath the earth to the present world by means of a ladder. Sometimes, as among Australian natives, the right thumb of a dead enemy may be cut off to prevent his spirit from using a spear. A common belief is that the spirit of the deceased

takes the form in which he died—a folk belief often portrayed even in movies. This notion may lead the aged in primitive societies to seek death before the period of decline sets in and they may enlist the aid of their close relatives in facilitating their passage.

Mourning customs, often involving wailing and gnashing, are an important feature of primitive culture. Mourning customs are frequently the reverse of ordinary life and are intended to symbolize a state of crisis. The name of the dead is tabu. The end of the mourning period is usually marked by purification rites and the lifting of some tabus.

In Western civilization, All Souls' Day, normally Nov. 2, is set apart each year in the Roman Catholic, Anglican, and Eastern Orthodox Christian churches for the commemoration of the departed who are supposedly in a state of purgatory and awaiting their final end. In Catholic countries the day is observed with solemn services, usually including requiem masses. The attack of the reformers on indulgences and votive masses led generally to disrepute in the Protestant churches of the whole cultus of the dead. Among Jews special prayers are said in commemoration of the dead (*yizkor* services) on the high holy days as well as during other religious festivals. Since the Middle Ages it has also been customary to recite the Kaddish, an Aramaic prayer for the coming of the Kingdom of God, during the first year of a bereavement and on the anniversary of the death of one's parents.

In modern Mexico, All Souls' Day, or the Day of the Dead as it is called, is made the occasion for visits to the cemetery by relatives of the deceased as well as for much feasting and conviviality. The latter element is probably owing to native influence and reflects symbolically a belief in the solidarity of the living and the dead in which the dead participate in the festivities of the living. As Josephina Niggli has expressed this sentiment in her poem, *All Souls' Day, Mexico*: "Let us bring our laughter to the dead and throw our song as flowers on their breasts. . . . Tomorrow we shall weep and all the long year through. But today let us take our laughter to the dead." See also CREMATION OF THE DEAD.

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DAVID BIDNEY,
Associate Professor, Department of Anthropology
and Department of Philosophy, Indiana University.

DEATH RATES embrace all measures of mortality from the crude rate (usually the number of deaths per 1,000 inhabitants) to various refined and special rates. Refined rates are nec-

essary mainly because (1) the age structure varies in different populations, and (2) the probability of dying varies with age. Since the ages most prone to death are those of infancy and early childhood and of late middle and old age, a population with a high proportion in these ages will have a higher crude death rate than one with a heavy concentration in the young adult ages, even when the age-specific death rates are the same in both populations. For this reason cities, with a high concentration of young adults, tend to have low crude death rates; but when the urban rates are corrected for this abnormal age structure, they usually turn out to be higher than the rural rates. The most refined measure of death tendencies is provided by the life table, which shows, among other things, the average years of life remaining at various ages according to the mortality experience of a given period. In the United States, for example, the average person subjected throughout life to the mortality conditions of 1950 would live 68 years; after age 40 he would live 33 years.

A special type of death rate is infant mortality—the number of children dying before one year of age per 1,000 of those born. In the United States in 1952 this rate was 28.5. Another special rate is maternal mortality. Also, a death rate can be computed for each cause of death—generally stated as the number dying from that specific cause per 100,000 of the population.

Throughout the world mortality is tending to decline. It has declined furthest in industrial countries, but in most underdeveloped areas it is now dropping rapidly, mainly because of the application of the latest public health and medical measures. Since birth rates almost invariably decline later than death rates, the drop in mortality has given rise to rapid population growth. How much further the reduction in mortality can be carried is not known. Since greater gains have been made in the younger than in the older ages, it may be that a limit is being reached. On the other hand, it seems possible that new discoveries will enable gains to be made in the older ages and thus the potential life span lengthened. As the population of industrial countries becomes older due to past declines in birth rates, the crude death rate will tend to rise unless new gains are made in medicine. In the United States in 1952 the crude death rate was 9.6, the lowest ever recorded up to that time; but such a rate reflects in some degree a favorable age structure.

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KINGSLEY DAVIS.

DEATH TICK. Two very small and delicate insects, *Clothilla pusatoria* and *Lepinotus inequilinus*, belonging to the family Atropidae, order Corrodentia, have been proven capable of making tapping sounds similar to those of the deathwatch beetle. The repeated tappings are the mating calls and are made by the females striking a thickened knob on the underside of the abdomen against a resonating substratum. A third suspect, the cereal psocid, *Liposcelis divinatorius*, long believed to be the death tick, apparently can-

not tick. All of these insects have been widely distributed through commerce.

DEATH VALLEY, California, a low desert in Inyo County. The name was given by a member of a party of emigrants who lost their way in 1849 and after intense suffering made their way out of the valley by climbing the steep slopes of the Panamints to the west in January 1850. Like all great valleys of California it is roughly parallel to the axis of the Sierra Nevada. Its length is about 140 miles, its width from 4 to 16. Nearly 550 square miles are below the level of the ocean. An area near Badwater is 282 feet below sea level, the lowest land in the Western Hemisphere. Telescope Peak, the highest of the Panamints, towering 11,045 feet above, probably stands higher above its immediate surroundings than any other mountain in the 48 states. Mount Whitney, the highest (14,495) point in the United States is less than 80 miles distant.

The valley is a completely enclosed graben formed by the sinking of a tremendous block of rock which left steep cliffs on the Panamint Mountains on the west and the Amargosa Range on the east. The valley as it is today, even though below sea level, has not been invaded by the sea. Following the glacial period, melting ice on the Sierra Nevada provided water for the filling of a chain of lakes extending from Owens Valley to Death Valley, the lowest of the series. After the ice had melted the climate became arid due to the "rain shadow" effect of the mountains to the west. As aridity increased and continued the lake area decreased and salts in the water which flowed into it became more concentrated and were eventually deposited. The geology of the area is very complex. It is stated that here is one of the most complete geological sections in America, which if pieced together in sequence would probably exceed 12 miles in thickness. There are throughout the valley examples of sculpturing by wind-driven sands. In the central part are 60 square miles of sand dunes.

Frequent heavy rains of cloudburst proportions in the mountains furnish water for swiftly moving streams which carry tremendous loads of detritus and deposit it at the mouths of canyons as alluvial fans. On the west valley slope these coalesce to form huge alluvial aprons. Numerous lava flows are found on both sides of the valley. In summer the valley is the hottest and driest place in the United States. Highest shade temperature recorded is 134°F. at Greenland (Furnace Creek Ranch); ground temperatures are no doubt higher but none have been recorded. Humidity drops to less than one fourth of one per cent; lowest temperature on record is 15°F.; rainfall averages 2.03 inches since 1938; clear days 283. From November to May the climate is nearly ideal.

The valley is noted for the number of new and rare plant specimens. Only the salt flats are devoid of vegetation; even on the edge of the salt a pickleweed grows. Among other plants are mesquite, Death Valley sage, desert holly, cactus, creosote bush, and many annuals. Animal life is surprisingly abundant. 26 species of mammals having been recorded on the valley floor. Reported are coyote, kit-fox, kangaroo rat, several species of lizards; 14 species of birds make their homes on the valley floor. Fish occur at two places; the "desert sardine" *Cyprinodon macularis*, is a tiny fish, maximum 1½ inches long.

Borax was responsible for the rediscovery and taming of the valley. Ore was discovered in 1873 but development did not begin until 1880 when ulexite (locally called cotton ball) was gathered from the valley floor and treated at Old Harmony Mill. The crude product was hauled to Mojave in huge wagons pulled by the famous twenty-mule teams. On the slopes of Amargosa Range a new and richer mineral was found and was named colemanite for William T. Coleman (1824-1893), one of the founders of the borax industry. A mine was developed and a town built which later was connected with Death Valley Junction by a narrow-gauge railroad. With the discovery of a still richer mineral, kernite (razorite), in the Mojave Desert, the borax activities were moved to the new location and the mine at Ryan closed down and the railroad abandoned.

Water is available in many locations; however, some of it is slightly saline. One spring of very good water provides a supply for the hotel and swimming pool and then irrigates Furnace Creek Ranch where dates are grown.

J. H. JONTE,

Professor of Chemistry, College of the Pacific.

DEATH VALLEY NATIONAL MONUMENT, an area of approximately 2,981 square miles including Death Valley and surrounding mountains, is administered by the National Park Service. It was established as a national monument in 1933. Some points of interest are: Devils Golf Course, composed of fantastic ridges and pinnacles of salt from one inch to three feet high. Zabriskie Point, a splendid example of badland topography caused by cloudbursts in soft lake beds. Ubehebe Crater, a group of small cones, the larger of which is one half mile wide and 800 feet deep. Dante's View, elevation 5,475 feet, from which the Badwater area, 282 feet below sea level, Telescope Peak (11,045 feet) and Mount Whitney (14,495 feet) may be seen.

Flowers.—When the winter rains have been sufficient and the temperature favorable, thousands of flowers transform the canyons, fans, and washes from a drab gray to a symphony of color with purples, golds, reds, and yellows contributed by desert sunflower, poppy, evening-primrose, astragalus, desert gold, Chinese lantern, and others. Accommodations are provided by hotels and cabins. The Park Service provides a public camp and assigns organized groups to suitable camp sites. The season is October 15 to May 15.

J. H. JONTE,

Professor of Chemistry, College of the Pacific.

DEATH'S-HEAD MOTH, *Acherontia atropos* Linnaeus (Ochsenheimer), is one of the largest moths having a wingspan of 5½ inches. The adult is a beautiful moth colored in shades of light and dark brown, yellow, purple and blue. It is a powerful flier, appearing after sundown, and during the early part of the night when it feeds on the nectar of many flowers and from time to time utters a penetrating mouse-like squeaking noise by rasping its very long and coiled mouthparts. In olden times the moths entered poorly constructed beehives for the honey which did not ingratiate them with beekeepers. The spherical green and bluish eggs are attached singly near the midribs on the undersides of the leaves of the solanaceous host plants including eggplant, nightshade, potato, tomato, and

others. The caterpillars, which hatch soon afterwards, are smooth, yellowish and, when mature, have seven prominent purple oblique lines on each side and purplish dots on the dorsum of the abdomen. The terminal horn forms a poorly defined "S." When mature and, having attained a length of 5 inches, they cease feeding, enter the ground to a depth of from 2 to 4 inches, excavate and waterproof a cell in which pupation follows and in which condition the insect hibernates and the adults emerge the following spring. Though considered a pest in early days it is scarcely mentioned in modern economic entomological literature but is always a collector's item. The insect has a very wide distribution in Europe, Asia, Africa, Madagascar, Azores.

E. O. ESSIG.

DEATH'S JEST BOOK (*The Fool's Tragedy*) is the most extensive and important work of Thomas Lovell Beddoes (1803-1849), begun by him at Oxford in 1825 and touched up and altered till near the close of his life. It was finally published in 1850. The play is a tragedy of revenge, written under the inspiration of such later Elizabethan dramatists as Webster and Tourneur, but embodying also a spirit of fantastic horror, a love of grim and spectral imagery, derived from early 19th century romance. Beddoes' special contribution is a species of weird merriment in death, sufficiently suggested by the strange title, *Death's Jest Book*. On one occasion the figures representing the medieval dance of death descend from their places on the walls of a cathedral to partake of a banquet with living men. The prime mover of the tragedy is a court fool, Isbrand, who causes the body of his murdered brother to be interchanged in the grave with that of the wife of his murderer, Duke Melveric. Melveric, by the incantation of an Egyptian sorcerer, summons up the spirit, thinking it his wife's and at the close of the drama is obliged to accompany the ghost to Hell. In plot construction, characterization, and all the specifically dramatic qualities Beddoes is very weak, but the songs with which the piece abounds are rich in poetry of a highly individual kind.

JAMES H. HANFORD.

DEATHWATCH BEETLE, *Xestobium ruficollis* De Geer (*Anobium*), is a small brown and grayish beetle 6-9 millimeters long. The adults enter cured hardwoods and lay their eggs in the burrows. The white larvae and adults often occur in tremendous numbers in old buildings. This and related species have long been called "death watches" because of their nightly mating calls consisting of a series of sharp, rapid taps of the head against the walls of their burrows. These nocturnal calls, which seem to come from nowhere, were long believed to portend death. In reality the calamity foretold was not destruction to humans, but rather to the once strong hardwood timbers that were slowly and surely being devoured.

E. O. ESSIG.

DE BARDELEBEN, *dě bār-dě-lā'bēn*, Henry Fairchild, American industrialist: b. Alabama, July 22, 1840; d. Birmingham, Ala., Dec. 6, 1910. A descendant in the paternal line of a Hessian captain in the Revolution, he was left fatherless as a child. At 16 he became the ward

of Daniel Pratt, Alabama's leading industrialist, whose daughter he married in 1863 while serving in the Prattville Dragoons (Confederate Army). After the Civil War he managed the Pratt iron works in the Birmingham district. A dominant figure in his state's industrial growth, he was called the "King of the Southern Iron World."

DE BARY, *dě-bā-rē'*, Heinrich Anton, German botanist: b. Frankfurt am Main, Germany, Jan. 26, 1831; d. Strassburg, then Germany, Jan. 19, 1888. After a course of medical studies he began in 1853 to practice in his native city, but in 1854 became a privat-docent in Tübingen, and the year after was called to be professor of botany at Freiburg. In 1867 he obeyed a call to Halle, and in 1872 to Strassburg, where he was the first rector of the newly organized university. De Bary is famous as a botanist for the contributions he made to knowledge of the morphology and physiology of the fungi, and he is considered to be the founder of the science of mycology. His work on plant pathology led to his discovery that parasitic organisms occupying plant tissues caused disease. He also did important research on algae and ferns. Among his works are *Comparative Anatomy of Phanerogams and Ferns* (1877) and the five-volume *Morphology and Physiology of Fungi* (1866-1884).

DEBENTURE, *dě-bēn'tūr*. A customhouse certificate issued to an importer, entitling him to a partial or total refund of customs duties paid on imported goods which have been subsequently exported. It is also used to evidence a claim for a refund of excise taxes paid on home manufactures sold abroad.

DEBENTURE BOND. A credit instrument issued by a borrower but not secured by a specific mortgage or pledge or assignment of property. It differs from a certificate of stock in that it represents a promise to pay the principal sum on a specified future date, together with periodic interest payments.

In corporation finance it is used, as a rule, by very large and well-established firms with a sound credit reputation (in which case a mortgage might be considered superfluous); or by corporations with substantial earning capacity, but possessing little or no property suitable for mortgaging.

In public finance, it is issued by national, state, or local governments to finance the construction of public improvements such as schools, hospitals, roads, or prisons. It does not, however, represent a lien upon any specific public property, but constitutes a general claim against the governmental body that issued it.

DEBIERNE, *dě-byērn'*, André Louis, French chemist: b. Paris, 1874; d. there, 1949. A graduate of the School of Physics and Chemistry, he became professor of chemistry there and later was lecturer in the Faculty of Sciences at the University of Paris. In 1900 he discovered actinium in pitchblende. With Mme. Curie he isolated pure radium.

DEBIT AND CREDIT (*Soll und Haben*). Out of the hunger for a national life, for a character that should be nationally German, for traditions upon which to build them and hopes where-

with to feed them, grew such novels as Gustav Freytag's *Debit and Credit* (1855), called by the Germans a *Zeitroman*, or novel of the times, to distinguish it from the historical romance or novel of other days. The book was a direct product of the revolution of 1848. *Debit and Credit* is the apotheosis of the great middle class, the merchant class, to which Germany owes so much of her growth, her success and her constructive national spirit. As such it has made a unique place for itself in German literature, and was in its day as widely translated and read as any book in the language. In spite of Freytag's consciousness, however, that in painting such an imaginative picture of the people he loves an author must use exceeding care to avoid "distortion in the outline of his picture, because not love alone, but hatred too, flows freely and readily from the pen," the book has, in a marked degree, the defects of its qualities. The glorified pictures of Anton, Schroter, Sabine and the other middle-class men and women, the likenesses of the slowly decaying landed aristocracy, of the rapacious Jews to whom they become a prey, of the Poles—a romantic and incapable nobility, a debased peasantry—who give way before the intelligent, eager, idealistic German colonists—all bear the stamp of that untruth which comes not of a purpose to be false but of prejudice.

EDITH J. R. ISAACS.

DEBORAH, dēb'ō-rā, Hebrew judge and prophetess. She lived in the time of the Judges, and by the aid of Barak delivered the northern tribes from the oppression of the Canaanites, securing a peace of 40 years' duration. The triumphal ode in Judges 5:2-31 attributed to her is a remarkable specimen of Hebrew poetry. The story is told in Judges 4:4-24.

DE BOW, dē-bō', James Dunwoody Brownson, American journalist and statistician: b. Charleston, S. C., July 10, 1820; d. Elizabeth, N. J., Feb. 27, 1867. He studied law, was admitted to the Charleston bar in 1844, became a contributor to the *Southern Quarterly Review*, published at Charleston, and in 1844 took charge of that periodical as chief editor. Among other papers prepared by him for its pages was the article "Oregon and the Oregon Question" (1845), which attracted much attention both in the United States and Europe. Translated into French, it was the occasion of a debate in the French Chamber of Deputies.

In 1845 De Bow moved to New Orleans and established the *Commercial Review of the South and Southwest*. The first number of this periodical appeared in January 1846. It continued to appear with several interruptions until 1880, and was generally known as *De Bow's Review*.

In March 1853 he was appointed superintendent of the United States census, collecting and preparing for the press a large part of the material of the census of 1850. He afterward compiled the volume entitled *Statistical View of the United States*, a compendium of the 7th census. In 1853 he compiled from his review a work published in three volumes under the title of *Industrial Resources of the Southern and Western States*.

DEBRAUX, dē-brō', Paul Emile, French balladist: b. Ancerville, Department of Meuse, France, Aug. 30, 1796; d. Paris, Feb. 12, 1831

He was an ardent Republican and wrote for the common people lively songs of wine and love, sung everywhere in tavern and workshop. His best-known songs are *Le Mont Saint-Jean*; *Bel-sarius*; *Soldat, t'en souviens-tu?*; *Le Veuve du Soldat*; *Marengo*; and *Fanfan la Tulipe*. He was sometimes called "the Béranger of the rabble" after Pierre Jean de Béranger (q.v.) who influenced him greatly.

DEBRECEN, dē'brě-tsěň, city, Hungary; located on the edge of grain and cattle country about 120 miles east of Budapest, it is a railroad and marketing center. Trading and manufacturing includes tobacco warehouses and factories, fertilizer plants, machinery and furniture factories, flour mills, soap works, brickyards, and tanneries.

Until administrative reorganization in 1950 separated large rural suburban areas from the city, it was Hungary's third largest city. Its growth dated from the 15th century when, as a walled town, it was a place of refuge for inhabitants from surrounding villages which had been plundered by the Turks.

The traditional stronghold of Hungarian Protestantism, Debrecen was the scene of a synod during the 16th century which proclaimed Calvinism the national religion. A Calvinist college was founded in 1588 and for over 400 years was one of Hungary's outstanding educational establishments, it being the foundation for the university which began in 1914. From the pulpit of the city's chief Protestant church on April 14, 1849, Lajos Kossuth moved the resolution to make the house of Habsburg forfeit the Hungarian crown. During World War II the city was taken by the Russians in September 1944, and in December of the same year the pro-Allied provisional Hungarian government was formed there. Pop. (1941) 125,936.

DEBRETT, dē-brěť, John, English publisher: d. London, Nov. 15, 1822. He took over the publishing business of John Almon in 1781, issuing new editions of Almon's *The New Foundling Hospital for Wit* (1784) and *Asylum for Fugitive Pieces in Prose and Verse* (1785-1788). In May 1802 appeared the first edition of his *Peerage of England, Scotland, and Ireland, containing an Account of all the Peers*. Debrett edited 14 subsequent editions of this work before his death. The first edition of *The Baronetage of England, containing their Descent and Present State*, by John Debrett appeared in 1808 and was just as successful as the earlier compilation.

DEBS, dēbz, Eugene Victor, American Socialist: b. Terre Haute, Ind., Nov. 5, 1855; d. Elmhurst, Ill., Oct. 20, 1926. One of the ten children of an Alsatian couple who emigrated to the United States in 1849, he worked as a boy in the Terre Haute railway shops, later becoming a locomotive fireman. He helped to organize the local lodge of the Brotherhood of Locomotive Firemen, was associate editor of its *Firemen's Magazine*, and head editor in 1880 when he was appointed the brotherhood's national secretary and treasurer. Meanwhile he had been elected city clerk. In 1884 he was elected to the state legislature. An early opponent of labor organization by crafts, he worked for organization by industries. In 1893 he helped to found and was

first president of the American Railway Union (A.R.U.). The next year the A.R.U. declared a sympathetic strike, supporting the Pullman Company strikers in Chicago. Convicted on a charge of contempt, Debs served a six-month prison sentence during which he became a convert to Socialism.

After campaigning in support of William Jennings Bryan in 1896, he converted what remained of the A.R.U. into a political party, the Social Democratic Party of America and, uniting it with a faction of the Socialist Labor Party, was a fusion candidate for president of the United States in 1900. In the national elections of 1904, 1908, and 1912 he was the Socialist Party presidential candidate, polling over 900,000 votes in 1912. Meanwhile, in 1905 he helped to found the Industrial Workers of the World, but subsequently withdrew, disagreeing with the more radical I.W.W. policies. Strongly opposing United States entry into World War I, in September 1918 he was sentenced to a 10-year prison term for sedition. Nominated a fifth time as his party's presidential candidate in 1920, despite the fact that he was behind prison bars he polled over 919,000 votes. President Harding pardoned him in 1921.

Though long the standard bearer for his party, he was never its intellectual leader. His social philosophy was naïve. Socialism, he was convinced, would cure all the evils of capitalist society, and capitalism itself was an unmitigated evil. His personal character—integrity, open-handed generosity and friendliness—earned him the affection and respect of his fellow-citizens of all political faiths.

DEBT, *dēt*, in law, ordinarily means an unconditional and legally enforceable obligation for the payment of money, usually founded on an express or implied contract. In certain contexts, however, the word may have a considerably more restricted or more comprehensive meaning. For example, under the early English common law a "debt" was a sum certain or readily reducible to certainty and payable in money only. In this sense, the term was limited to an obligation which could be enforced, under the technical rules of pleading, by an action of debt (*q.v.*). This narrow definition of debt at present has little practical significance. At the other extreme, the term "debt" may be used to describe virtually any obligation. In the Uniform Fraudulent Conveyances Act, it is defined as including "any legal liability, whether matured or unmatured, liquidated, absolute, fixed or contingent." In the most extensive sense, "debt" includes everything which one is obliged to do, pay, or perform, whether expressed in terms of money, goods, or services.

In its usual legal meaning of an unconditional obligation, a debt must be certain rather than contingent. It is thus distinguishable from a "liability," which may be either fixed or contingent. A debt must be for a sum of money which is ascertained or which is capable of being readily reduced to a certainty (in legal parlance, a "liquidated demand"). For this reason, it does not generally include the obligation arising from the commission of a tort, unless the claim has been reduced to judgment.

Because of the abolition of the strict rules of pleading in most jurisdictions, the concept of "debt" is not nearly so important in the law as it once was. It still has some significance, however, as a term used to distinguish the money

obligation arising out of an express or implied contract or a judgment from other situations involving different legal relationships. A trust (*q.v.*), in contradistinction to a debt, involves more than a liability on the part of one person (the debtor) to pay a definite sum of money to another (the creditor). The beneficiary of a trust has a property interest in specific assets held by another person (the trustee), rather than merely a personal claim against another individual for a money payment. The difference may be traced back to the difference between the common-law actions of account and of debt, the underlying idea of the former being that the defendant was entrusted with property as a fiduciary for which he was under an obligation to account, whereas the latter action involved only a claim for money and did not relate to specific property. The duty owed by a trustee to a beneficiary is much higher than that owed by a debtor to a creditor. Being a fiduciary, a trustee is not permitted to deal with the trust property in any way that might bring his own interests in opposition to those of the beneficiary. In determining whether a particular relationship is a debt or a trust, the intention of the parties is the determining factor. If it is intended that the payee of money is to have the use of it as his own and be under a merely personal liability to repay it, a debt is created. If it is intended, on the other hand, that an equitable interest in the money shall remain in the payor or be created in a third person, the payee holds the money as a trustee. If the language of the parties is unclear, their intention may be inferred from the surrounding circumstances, such as an agreement to pay a fixed rate of interest (indicating a debt), or an agreement to invest the money and pay over the proceeds whatever they may be (indicating a trust). The distinction between a debt and a trust is important in determining the nature of the remedies available to the payor, the applicability of statutes of limitations, the incidence of the risk of loss, the effect of the payee's insolvency and the liability of the payee to criminal prosecution.

Consult "Debt," *Corpus Juris Secundum* (Brooklyn, N.Y., 1941; supplement 1953); Scott, A.W., *Law of Trusts*, vol. 1, chap. 1 (Boston 1939; supplement 1953).

RICHARD L. HIRSHBERG.

DEBT, Action of, was one of the common-law forms of action, used in various situations to recover a fixed sum of money or a sum of money ascertainable by computation from fixed data. The action could be brought to enforce an oral, written, or implied contract, a judgment, a statutory penalty, and many other legal obligations similarly reducible to a sum certain. Like other forms of action, debt is at present primarily of historical interest, due to the abolition or modification of technical rules of pleading in the procedural law of most jurisdictions. Under the Federal Rules of Civil Procedure, which govern pleading in all federal courts throughout the United States, there is only one form of action, known as the "civil action," which includes all of the old common-law actions as well as equity actions. Most of the states have similarly abandoned or drastically modified the old forms of action, substituting for them a single form of civil action. In England, the forms of action decreased in importance during the 19th century and were finally abolished by the Judicature Act

of 1875. A modern action to recover a fixed sum of money in British courts is commenced (like other civil actions) by a writ of summons stating simply the general nature of the complaint, setting out in stereotyped form the facts upon which the plaintiff relies. The old "common counts" in actions of debt on simple contract, which had to be adhered to before the forms of action were abolished, were: money lent, money paid by the plaintiff at the defendant's request, money received by the defendant to the use of the plaintiff, money due on account stated, goods sold and delivered, goods bargained and sold, interest on money due, and work and materials used.

RICHARD L. HIRSHBERG.

DEBTOR AND CREDITOR, Laws of.

The law of debtor and creditor relates primarily to the various procedures available to a creditor to compel the payment of a debt due to him. Since a debt (*q.v.*) generally arises out of an agreement or other voluntary transaction, the substantive question of whether or not a debt exists (as distinguished from the procedural problem of how it is to be collected) falls largely within the fields of contracts and sales (*qq.v.*). The usual method of collecting a debt, if peaceful persuasion fails, is for the creditor to sue the debtor, thus reducing his claim to judgment, and then to levy execution (*q.v.*) on the debtor's property in order to enforce the judgment. In many instances, however, this remedy is unavailable or inadequate. If this is the case, a creditor may resort to an interlocutory remedy at the beginning or during the course of the principal lawsuit, may bring an action of garnishment (*q.v.*), or may avail himself of a creditor's bill, an equitable action to reach assets of the debtor not subject to execution.

Execution.—When a debt is to be collected by execution, a necessary preliminary is a judgment. This is the official decision of a court by which the rights of parties to a controversy are settled. Before it can give the successful creditor any rights in the property of the debtor, a judgment must be formally recorded—a procedure known as "docketing" or "entry." Once docketed, a judgment automatically imposes a lien (*q.v.*) upon any real estate of the debtor located within the county where the docketing takes place. In some states, it has been provided by legislation that a lien upon personal, as well as real, property takes effect upon the recordation of a judgment. In most states, however, in order to acquire any legal interest in personal property of a debtor, a creditor must issue an execution, which is a writ directing the sheriff or marshal to put the court's judgment into effect. After the execution has been levied, a process by which the sheriff takes possession, the property is disposed of at an execution sale in order to satisfy the judgment. The time at which the lien of an execution attaches to the property of a judgment debtor depends upon the law of the jurisdiction where the proceedings take place. In some states, a levy is required before the execution can create a lien. But in most states, the delivery of the writ of execution to the sheriff creates a lien, except as against a purchaser in good faith of personal property who is without notice that an execution has been issued. The priority of claims against a particular piece of property among various judgment creditors depends upon the order in which they issue executions, in states

where this majority rule prevails. A creditor can lose his priority, however, by placing his execution in the hands of the sheriff with instructions not to levy or to delay the execution sale.

Attachment.—Although an execution is the normal method used to enforce a judgment, it may be necessary or advisable in some cases for a creditor to take action directed toward subjecting his debtor's property to his control at some time prior to the conclusion of a lawsuit brought against the debtor. The most common of such provisional, or interlocutory, remedies is attachment (*q.v.*), which is the seizure of a person or his property by judicial order to bring him or it within the jurisdiction of the court. The seizure of a person is also known as "civil arrest." (See *CAPIAS*.)

The seizure of property by attachment is accomplished by issuing an order to the sheriff at the commencement of, or during the course of, a lawsuit directing him to take the property, rights, and credits of the defendant and hold them as security for the satisfaction of such judgment as the plaintiff may recover. It is an extraordinary remedy in most jurisdictions, available principally where the defendant cannot be served personally with a summons or where there is reason to believe that he may fraudulently dispose of his property during the pendency of the suit. In the New England states, attachment of property is permitted at the commencement of practically all civil suits. In other states, the remedy is restricted to cases where the plaintiff can show special grounds, such as nonresidence, absconding, concealment, or fraud.

The availability of civil arrest is even more limited than that of attachment of property, being confined primarily to cases of fraud and absconding. Since the effect is to deprive the person arrested of his liberty until he makes satisfaction of his debt, this type of arrest is forbidden in most states, except in unusual cases, by constitutional provisions relating to imprisonment for debt. Civil arrest was formerly used to a great extent both in England and the United States, until a reform wave starting about 1830 led to the American constitutional provisions and to restrictive legislation in England in 1869. The intention and effect of the present law on the subject in England is that a fraudulent debtor shall be punished, but that an honest debtor shall not. Arrest or imprisonment for making default in the payment of money is abolished except in certain specified cases, such as failure to pay a penalty or default by a trustee or other fiduciary ordered by a court to pay a sum in his possession or under his control. In the excepted cases, the defaulting person is liable to imprisonment for a period not exceeding one year.

Garnishment.—Certain kinds of property belonging to a judgment debtor cannot be reached by execution. In cases where property of a debtor, including money and credits due to him, is in the possession of another person, the process by which the creditor can pursue it is called garnishment. This is a statutory proceeding, and is the equivalent of an attachment of amounts owing to the debtor. Since it is not a common-law remedy, its use is generally limited strictly by the terms of the statute providing for it. Wages and salaries below a certain amount, as well as certain percentages of the excess above the specified minimum, are usually exempt from garnishment. The remedy is rarely available

until the plaintiff has exhausted all other methods of proceeding against the defendant's property, and will not be permitted except in cases where the judgment debtor himself could maintain an action against the garnishee. Thus, if the garnishee can present a defense which would defeat an action brought against him by the judgment debtor for the same subject matter, then the judgment creditor cannot prevail in garnishment proceedings.

Creditor's Bill.—A creditor who has exhausted the legal remedies of execution, attachment and garnishment can often reach the property of a debtor by means of a creditor's bill. This remedy is also frequently used to reach property which a debtor has transferred in fraud of his creditors. As a general rule, any property of a debtor which, because of its nature rather than due to a positive exemption, cannot be taken by the usual means afforded by the law, can be subjected to a creditor's bill. Conversely, since the creditor's bill is an extraordinary remedy, it is not available to take property subject to the normal legal processes of attachment and execution. Property which is specifically exempt from levy and sale under the ordinary process of execution (such as homesteads, pension money and certain interests in insurance policies) cannot be reached by creditor's bill. One type of property that can clearly be reached by this procedure is a debtor's equitable interest in land or personal property. Since the legal title is in a person other than the debtor, the remedy of execution is inadequate. Another type of property subject to this extraordinary remedy is the beneficial interest of a debtor in a trust. It is possible, however, for the creator of a trust to place the fund beyond the reach of creditors, the general rule being that creditors can reach only such rights as the beneficiary himself might exercise against the trust estate. A fund so insulated from creditors, as a precaution against the beneficiary's improvidence or incapacity, is called a "spend-thrift trust." Among other valuable interests belonging to a debtor which can be reached by creditor's bill are patent rights, copyrights, and trademarks. See also **BANKRUPTCY LAWS**.

Consult Oleck, Howard L., *Creditors' Rights and Remedies* (New York 1949); Hanna, John and MacLachlan, James A., *Cases and Materials on Creditors' Rights*, 4th ed. (Brooklyn 1951); Oleck, Howard L., *Debtor-Creditor Law, a Treatise* (New York 1953); Nadler, Charles E., *Law of Debtor Relief*; (Atlanta, Ga., 1954).

RICHARD L. HIRSHBERG.

DEBTS, Public. Public debts are essentially a modern phenomenon. Before they could appear, private credit, with its accompanying mechanism of banks, brokers, and credit instruments, had to be developed, and before states could resort to public borrowing on any considerable scale two other preconditions had to be met. These conditions have been fulfilled only in comparatively recent times. The first is the existence of a money market where capital can be obtained in exchange for formal promises to repay in the future, these promises constituting a public debt. A money market requires a supply of free capital, the machinery for conducting transactions, and, not least, willingness on the part of the owners of capital to lend their money. This last points to the second of the conditions mentioned above, namely, assurance that the loans will be repaid. At first the promise of a needy monarch was

backed up by the pledge of some tangible security, as the crown jewels, or land, or the revenue from some impost. But even these proved inadequate, for the monarch sometimes repudiated his debt. With the development of constitutional government a firmer security has been given the lender, which consists in the power and influence of the propertied classes to prevent legislative bodies from repudiating public obligations. The public creditors in effect lend to a corporation—the government—which they themselves control. Their confidence has seldom been misplaced.

The first creation of public debts on any considerable scale took place in the 18th century, and the 19th century saw an enormous increase in the number of countries contracting public loans and in the sum total of such loans. At first confined mainly to European countries, the number was steadily augmented by the appearance of new borrowers: the United States after 1790; various Latin American countries and India after 1815; and Japan, Australasia, and the new African states after 1870. It has remained, however, for the 20th century to demonstrate the extent to which modern states can make use of their credit in times of national emergency. The following table shows the growth of the public indebtedness of the chief borrowing nations of the world during the past two and a half centuries—due to various difficulties (explained in the footnote), the figures must be regarded as little more than informed estimates, but the trend they show is clear:

NATIONAL INDEBTEDNESS OF CHIEF BORROWING NATIONS¹

	Aggregate debt (U.S. dollars)	Per cent increase
1714	1,500,000,000	
1793	2,500,000,000	66.7
1820	7,750,000,000	210.0
1848	8,650,000,000	11.6
1862	13,752,000,000	58.9
1872	23,025,000,000	74.7
1882	26,970,000,000	17.1
1890	27,525,000,000	2.0
1908	36,548,000,000	32.8
1912	42,000,000,000	16.0
1918	150,000,000,000	225.0
1930	110,000,000,000	- 37.0
1940	166,000,000,000	51.0
1950	486,000,000,000	193.0

¹Figures for the years 1714-1882 are taken from Henry Carter Adams' *Public Debts* (1887); those for 1890-1912, from the U.S. census volumes on wealth, debt, and taxation. The 1918 estimate, compiled by the author, represents only the indebtedness of the seven leading belligerents in World War I; so great was the financial chaos that a true world picture cannot be obtained. The debts of the leading nations in 1930, 1940, and 1950 were obtained from the *Statistical Yearbook of the United Nations* and were converted into U.S. dollars at the official rates of exchange. As the 1950 figure shows, the necessities of World War II raised the aggregate national indebtedness to a fantastic sum; inflation and depreciation of currencies make an accurate conversion of these debts into U.S. dollars difficult.

Purposes of Debts.—The purposes for which governments may properly incur debts are in the main reducible to three—temporary need, extraordinary emergencies, and the construction of public works.

Temporary Need.—Governments find themselves in temporary need of funds when actual revenues fall below estimated revenues or when appropriations exceed revenues; in either case a deficit is produced. It is, of course, impossible that the budget should balance exactly each year, and at best a slight surplus or a slight deficit

is unavoidable. It may be argued that the deficits could be avoided by always providing for a surplus, but constant surpluses are wasteful and are dangerous in tempting the legislative body to extravagance—for illustration we need only point to congressional extravagance in the United States between 1888 and 1892, when huge surpluses were piling up in the Treasury. They are therefore to be avoided.

Occasional deficits, then, may be regarded as normal incidents in government finance. Since they are expected to be temporary, provision to meet them may conveniently be made by the issue of short-term treasury notes or by tax certificates, which will be redeemed out of incoming revenues. The necessary funds may be obtained by increasing some tax or impost or by greater economy on the part of the legislative body until the deficit is erased. It is only when supposedly temporary deficits become chronic and the government disposes of the accumulated arrears by adding them to the permanent debt, instead of meeting them by taxation or economy, that the practice becomes dangerous. This method of treating temporary deficits—used by Austria from 1904 to 1914 and by other countries, notably France, since then—must be condemned; temporary deficits should never be allowed to become part of the permanent debt.

Extraordinary Emergencies.—By far the greatest part of existing national debts has been incurred to meet special emergencies, such as famine, fires, flood, and war. Since war has been the most important historically, this discussion will confine itself to the methods used in meeting wartime emergencies.

In general, a special emergency arises only when a government's need of money is so immediate and pressing that it cannot wait for the tardy returns of new taxes. One of the earliest, but now obsolete, methods of meeting such needs was the accumulation of a "war chest" in prosperous times to serve as a reserve for use in emergencies. Frederick the Great of Prussia set up such a war chest, which in 1872 contained \$25 million in gold; by July 1913 this was increased to \$60 million, to which were added various securities. It may be conceded that such a reserve renders the first mobilization of troops easier, but as a substitute for borrowing the enormous sums necessary in modern warfare it is ludicrously insufficient. Moreover, the method has various financial weaknesses.

A second means of meeting the urgent demands of a sudden fiscal emergency is an increase in the rate of some existing tax or taxes, so as to bring in the needed additional revenue. English procedure with the income tax and that of the United States with excise taxes may be cited as illustrations. In the relatively peaceful years of the 19th century the rate of the income tax in England was purposely kept low, but the machinery for collecting the tax was always kept in good working order. If an unexpected emergency occurred, additional revenue could be obtained quickly merely by raising the rate. "That is to say," wrote Henry Carter Adams, "this policy establishes a war chest whose funds are deposited with the people, and assigns a particular tax to serve as its key." Exception may be taken to reserving the income tax solely for use in emergencies, for this tax should form an integral part of any scientifically constructed scheme of taxation and its full use should not be restricted to

special needs; but the principle is sound. It was invoked by the United States in 1914 when the sudden need for greater revenue led to "emergency taxes" consisting largely of an extension of the flexible internal revenue system, whereby a vast expansion of indirect taxes was carried out. The lack of such an easily expandable system of taxation had been keenly felt at the beginning of the War of 1812, and again when the Civil War opened.

This second method, however, is not always feasible at the beginning of a fiscal emergency, when funds must be had at once; it takes time for new taxes to become productive. And to make sudden or large increases in existing taxes may introduce greater evils and injustices in a well-adjusted tax system than would be involved in a resort to borrowing. It was strongly urged at the beginning of World War I that the United States broaden its tax base and adopt a pay-as-you-go system of meeting war costs out of current taxation. But the costs were too great for this method, although the country did raise by taxation about one third of the amount it needed.

A third method by which a nation may raise funds to meet a fiscal emergency is the issue of paper money. But so serious and far-reaching are its effects that this use of its credit by a modern nation is generally resorted to only in the last extremity. The classic examples of inflation cited to show the evils of unregulated issues of paper money are the American Continental currency and the French assignats. The former were issued by the Continental Congress between 1775 and 1779 to finance the revolution against Great Britain; the latter to finance the French Revolution between 1789 and 1797. In both the history was the same: overissue, depreciation, derangement of prices with accompanying injustices as between debtors and creditors, and final repudiation by the issuing government. In essentials, the same story has been repeated almost every time a government has resorted to this method. The experience of the German Empire during World War I, which was financed largely by paper money, is the most extreme example. Altogether 92.8 quintillion marks were issued (that is 92.8 followed by seventeen ciphers). The last quotation of the paper mark in United States currency was .000,000,000,043 of a cent; after which it gradually disappeared from circulation. One result, however, was the extinguishment of the German internal war debt with depreciated paper money.

The lesson of paper money had been made clear, but so great was the pressure of World War II that no nation escaped the necessity of resorting again to paper money to meet its costs. The same old evils appeared, inflation and depreciation. To meet the latter, devaluation was resorted to; seldom was there outright repudiation. Some measure of the monetary and fiscal derangements caused by these "forced loans," as issues of government paper money were euphemistically called, are registered in foreign exchange rates.

Since none of the methods just described satisfactorily solves the problem of meeting extraordinary emergencies, we are forced back upon public borrowing as the final alternative. But before discussing this, the third purpose for which debts may be incurred should be mentioned.

Public Works.—If it is decided as a matter of public policy that a project is to be constructed by government funds rather than by the invest-

ment of private capital, several considerations dictate the use of borrowing rather than of taxation. From an engineering standpoint it is essential that the money for the project be freely available, so that the work can be carried through to completion without unnecessary delay. Any interruption means waste, for an idle plant, half constructed, would deteriorate rapidly and much of the work would have to be done over again. A speedy completion is essential also from an economic standpoint, so that the work may become productive: a half-finished road or electric light plant involves expense, but yields no return. An increase in taxation is both too slow and too uncertain a method to bring in the large sums necessary to construct a modern public work; public borrowing is therefore desirable from engineering, economic, and fiscal points of view.

In recent years an old device, formerly much used but long discarded, has been reintroduced in the United States to make some public works self-liquidating. Tolls are exacted from users of publicly built and financed highways and bridges, and are applied to the payment of the outstanding bonds. Thus the users rather than the general body of taxpayers pay for the improvement. In other cases, as river and harbor improvement, whose benefits cannot be allocated, costs are necessarily met out of taxation.

Some Definitions.—A few definitions are necessary at this point in the discussion. First, a distinction must be made between *forced loans* (such as issues of paper money) and *voluntary loans*. The heavy weight of war debts led to the use of the latter in Germany, the Netherlands, and Russia in 1920, but in other countries subscriptions to loans are made by choice of the lenders.

With reference to its legal status a public debt is classifiable as floating or funded. A *floating debt* consists of unpaid accounts charged against the state, while a *funded debt* is one that has been formally acknowledged by the government and its payment provided by law.

Funded debts may be subdivided, on the basis of the time they have to run, into terminable and perpetual debts. By a *terminable debt* is meant one that runs for a certain specified term, upon the expiration of which it is redeemable or convertible at the option of the government. By a *perpetual debt* is meant one whose contract mentions no definite time at which payment can be demanded by the creditor; though theoretically the government may pay off such a debt at will, it seldom exercises this privilege and in practice the debt becomes a perpetual one. Such is the form in which most of the French debt has been thrown, while the favorite form for debts incurred by federal, state, or local units of government in the United States has been the terminable bond.

A third form, intermediate between the two just mentioned, is the *annuity*; this is used in Great Britain. By this method the debt is really paid in installments, and the obligation of the government is terminated upon the expiration of the term agreed upon, whether a certain definite date or the death of an individual.

Terminable Bonds.—These seem to offer the greatest advantages. When this type of bond matures the government is given the opportunity of paying it off or of converting it into another bond bearing a lower rate of interest. Inasmuch as most debts are created in times of crisis or urgent necessity, the rates of interest at which

they are created are usually higher than such rates become with the return of more normal times; moreover, historically the tendency of the 19th and 20th centuries has been toward ever lower interest rates. Issuers of terminable bonds with comparatively short terms and frequent conversions are able to take advantage of these conditions and thus lower the national interest charge. The saving effected can be applied to a reduction of the principal.

Is a Public Debt a Burden?—In answering this question a distinction must be made between external and internal debts. In the case of the former the burden is easily recognized: it is measured by the sum of money payments for principal and interest to foreign creditors. The burden upon the debtor nation is the loss of the economic welfare which these payments involve; the nation must forego improvements at home which might have raised the standard of living, while it endures taxes to pay the external debt.

Fortunately, most public debts are internal, that is, the evidences of debt owed by the government are held within the country by its own citizens. Many writers have held that there is no burden involved in an internal debt, for the citizens who pay taxes to meet interest and other charges themselves receive the income from the bonds; it is a mere bookkeeping operation. But this assumption is open to serious question. Since public securities are owned mainly by the rich, and taxes are paid largely by the less well to do, the transfer involves a direct burden upon the latter group. If payments and receipts were equally balanced, it might be claimed that there was no real burden except for the costs involved in the transactions, but this is seldom the case and one must conclude that in general even an internal debt constitutes a burden on some group.

Another misconception may be cleared up at this point. It is not possible to make posterity pay our debts. The generation that used the things bought with the borrowings actually paid for them at the time with resources and labor; the bonds issued were evidences of claims to reimbursement at some future time. If posterity reduces the debt it is not paying back these sums to the previous generation, whose members are dead; it is simply paying members of its own generation.

Advantages and Disadvantages of Borrowing.—Why do modern nations borrow money rather than obtain it by taxation, by lotteries, or in some other fashion? In some cases, like war, there is no question. A great and sudden emergency cannot wait for the slow returns from taxation, and a resort to borrowing is unavoidable. Moreover, the sums demanded are so large that the taxes necessary to raise them would be monstrous, while a loan is borne easily. It has been estimated that the limits of borrowing are about 20 times greater than the limits of taxation. In addition a loan is freed from the checks upon taxation and is more easily voted.

Numerous other advantages have been claimed for public borrowing. In the 18th century it was urged that bonds afforded a safe and convenient form of investment, but in this day of corporate and public utility securities such an argument has little weight. It has also been contended, as by Alexander Hamilton, that the issue of government bonds is the equivalent of so much new capital in a country. Some writers have carried this doctrine so far as to suggest that England's

progress in the 19th century was in part owing to the existence of her large national debt.

A more solid advantage lies in the fact that by a policy of borrowing a government can obtain that part of the national capital which is freely disposable, while a system of extremely heavy taxation might have serious economic consequences and involve practical confiscation of some incomes, resulting in impairment of the fund out of which improvements in production are normally made and in a halt to progress. The purchaser of a government bond, on the other hand, gives his money voluntarily for public uses in exchange for an equivalent. It is not, therefore, in ordinary circumstances money withdrawn from production; only the free capital, the surplus from current income, is placed at the government's disposal. Under this system private industry is interfered with as little as possible.

Still, there are undeniable disadvantages and dangers connected with the constantly increasing tendency to resort to public credit to meet all unusual or large expenditures. Perhaps the greatest danger lies in the ease with which public debts are contracted. Heavy taxation arouses resistance, but borrowing is accepted with little opposition. It is so easy to impose the burden of an unusual cost upon the people by borrowing, instead of by levying heavier taxes, that there is danger that this may be done even when there is no real justification for it. Many a community in the United States is today paying the interest on bonds issued to pay for improvements that either were never constructed or wore out before the debt was paid. It is also generally the case that money raised by loans is spent more prodigally than that derived from taxation.

Another danger lies in the effect that the raising and spending of large sums obtained by the sale of government bonds may have upon private industry. This will be keenly felt if the need of the government is great and it raises the rate of interest in order to attract the needed supply of capital, thus diverting from private industry the capital which would normally have replaced losses from depreciation or obsolescence or have provided for the ordinary expansion of businesses. But before characterizing such a diversion as necessarily evil, we shall have to know the use to which the money will be put. It may be that the government expenditure will bring advantages so great as far to outweigh any losses that may be inflicted upon private industry; unhappily the reverse has usually proven true in the past.

Should a Public Debt Be Paid?—The final problem, but probably the most important of all after the debt has been incurred, is that of debt payment. Should a nation endeavor to pay off its debts? The policy adopted by the United States from the very beginning of its national existence has been one of debt payment, but this practice has been followed by few other nations. The 19th century saw some moves in this direction by half a dozen European countries, but the 20th century has seen them all engulfed in a hopeless morass of new debts and deficits. The difference in early practice reflects two very different theories as to the desirability of debt payment. One school holds that the only way to reduce or to get rid of the burden of a public debt is to pay off the principal; the other wishes to accomplish the same end by so developing the resources of the country that the burden of interest payments becomes negligible.

The arguments against debt payment, or rather, in defense of a permanent debt, may be stated briefly. It is claimed that the burden of a public debt is gradually lessened by the depreciation in the value of gold; this, however, is both too uncertain and too tardy in effect to be assigned much weight, especially in this age of managed currencies. Another argument, entitled to more serious consideration, holds that the burden of debt will be diminished by the natural growth of the country in population, industries, and wealth. Thus in the United States the debt in 1952 was the same as in 1945, but the per capita burden had fallen from \$1,850 to \$1,650, owing to the growth of population.

A third argument urges that surplus revenues be applied to tax reduction before debt reduction. Thus John Stuart Mill, writing of English conditions in the 1840's, said: "the increase of revenue should rather be disposed of by taking off taxes than by liquidating debt, as long as any very objectionable imposts remain." Eventually, he admitted, the remission of taxes should stop and the surplus be applied to debt payment. But others have been unwilling to grant even this, and have insisted that taxes fructify in the pockets of the taxpayers—that these persons can promote the general welfare more if they are not taxed than if taxes are collected from them and applied to the reduction of a national debt.

The arguments in favor of a policy of debt payment rest upon firmer ground, and justify the practice of the United States. They are partly economic and partly political. In the first place it has been argued that payment of a debt converts the bondholder, until then a drone living upon his income, into an active man of business. The government, having collected money from the taxpayers, hands it over to the bondholders in exchange for their bonds, and these latter must then actively interest themselves in the investment of the capital thus received, and in many cases must undertake the operation of new enterprises in order to safeguard it. Society is better off by this addition, forced though it be, to the number of productive workers. Moreover, the very existence of an idle class, supported by the proceeds from general taxation, is considered a social menace, and payment of the debt is thus regarded as socially desirable. It must be admitted that this last argument loses force when government bonds are widely distributed, as in most nations today.

The political argument for payment of a national debt runs as follows. In most nations the national debt is almost entirely a legacy of war, and there is no guarantee that this catastrophe may not return. If the adage "in time of peace prepare for war" be true, it applies with special strength to the reduction of the national debt in times of prosperity at as rapid a rate as is consistent with sound economic development. This precept was followed in the United States after World War I, when the war debt of \$26 billion in 1919 was cut down in the next 10 years to \$16 billion in 1929. Unfortunately it was not possible to pursue the same policy after World War II. It is a truism of modern warfare that victory is determined largely by economic and financial strength, and a most important element in this is sound public credit. Nothing supports such credit better than a policy of debt reduction.

A third theory as to debt payment has been advanced in recent years, although fortunately it

is not widely held. Far from urging payment of the debt or holding it at an even per capita level, this theory advocates a steady expansion of the national debt as essential to national prosperity. The private economy, it is urged, has reached its zenith and can no longer be trusted to spark the progress of the future. Into this vacuum the state must step and expand its activities, raising the necessary capital by borrowing. New credit agencies should be developed to finance the future. The increasing debt would also act as a support to the banks. This theory runs counter to two principles of public finance long held in the United States, namely, that a national debt should be paid off and that efforts should be made to balance the budget.

Methods of Debt Extinction and Reduction.

—The most drastic method of getting rid of a national debt is to repudiate it. This step was taken by the Bolsheviks in Russia in 1917, when they outlawed all the czarist debts; this in spite of the well-known principle of international law that a change in government does not relieve a nation of its obligations. The czarist debts are still uncollectible. A less drastic but equally effective method was used by Germany, which diluted its currency to the point of worthlessness during World War I, as already described. Another example was the "suspension" in 1929 of the intergovernmental debts created during World War I; except in the case of Finland, which has paid, they still stand on the ledgers of most European nations, but have in effect been repudiated.

Another method of quick reduction of the public debt was widely discussed after World War I in Great Britain, Europe, and Australasia, but was applied only in Germany in a diluted form. This is the capital levy, a heavy tax on all privately owned wealth or, in another version, on bonds alone. Discussion revealed so many weaknesses and injustices in the scheme that it was soon dropped.

A public debt may also be scaled down by a compulsory reduction of the rate of interest on existing debts. This has been done by compulsory conversions, as in Australia and New Zealand, or merely by decree, as in France. Although the ugly word "repudiation" has generally been avoided, the burden of debt has grown so heavy that any means of escape has been seized upon. It is clear that even the solemn promises of sovereign states carry risks.

Debt Payment.—If in the light of the discussion under *Should a Public Debt Be Paid?* payment is decided on, there is still the question of how this is best done. A time-honored method is by means of a sinking fund, into which a fixed, inviolable sum is paid each year. This scheme was put into effect in Great Britain by the younger William Pitt in 1786 and was continued by the British government during the Napoleonic Wars and later. Its absurdity was finally revealed when it was disclosed that between 1786 and 1829 the government had borrowed more than £300 million at 5 per cent interest in order to pay a debt bearing $4\frac{1}{2}$ per cent interest. It was thereupon abandoned.

This leads us to the correct policy of debt payment, which consists in the establishment of a permanent appropriation beyond the annual interest charge. But such an appropriation must come out of surplus revenue and cannot be "inviolable." No automatic machinery can compel the extinction of a public debt unless there exists

a clear revenue to devote to that purpose. Considerable discretion must be granted in the administration of a system of debt payment, for it must necessarily be suspended in periods of deficit. The United States follows this method of a modified sinking fund. One favorable feature may be claimed for the sinking fund policy: it commits a government definitely to the principle of debt payment.

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ERNEST L. BOGART,

Author, "War Costs and Their Financing."

DEBUSSY, də-bū'sē', (Achille) Claude, French composer: b. St.-Germain-en-Laye, France, Aug. 22, 1862; d. Paris, March 25, 1918. After youthful piano lessons, Debussy entered the Paris Conservatoire in 1873, continuing his studies there until 1884, when he won the Prix de Rome with his cantata *L'Enfant Prodigue* (The Prodigal Son). As winner of the Prix he studied intermittently at the Villa Medici in Rome from 1885 to 1887, then returned to Paris.

Such early works as *L'Enfant Prodigue* and *La Demoiselle Elue* (1888), a setting of a French translation of D. G. Rossetti's *Blessed Damozel*, vaguely foreshadow Debussy's mature style, which was decisively molded during the 1880's by acquaintance with Modest Musorgski's opera *Boris Godunov*, other Russian music, and an East Indian gamelan orchestra that visited the Paris exposition of 1889. At about the same time Debussy began to throw off his earlier enthusiasm for Wagner, becoming increasingly conscious of himself as a French musician.

In 1892, Debussy, who had already composed songs of great distinction, began work on incidental music for Maurice Maeterlinck's drama *Pelléas et Mélisande* and for *L'Après-midi d'un Faune*, a scene in verse by Stéphane Mallarmé. His public reputation grew with performances in 1893 of his String Quartet and *La Demoiselle Elue*, and the *Prélude à l'Après-midi d'un Faune* (*Prelude to the Afternoon of a Faun*) received its controversial but successful first presentation in 1894. In the next year Debussy decided to set *Pelléas et Mélisande* as an opera; he was still at work on it in 1899 when he married Rosalie Texier, a dressmaker. *Nuages* (Clouds) and *Fêtes* (Festivals), two of three *Nocturnes* for orchestra, were given successfully in 1900; the third, *Sirènes* (Sirens), was presented in 1901.

The first performance of *Pelléas et Mélisande* at the Opéra-Comique on April 30, 1902, aroused violent controversy. Repudiated by Maeterlinck, it was nevertheless a considerable popular success.

During the next two years Debussy wrote the *Estampes* (1903) for piano, and he gained a certain notoriety when his wife attempted suicide after he had abandoned her for the wealthy Mme. Emma Bardac. He married Mme. Bardac in 1905; they had one daughter. Debussy's next large work, the orchestral triptych *La Mer* (*The Sea*), was presented in 1905, the year in which he completed the *Suite Bergamasque* for piano, begun in 1890. In 1906 he began *Ibéria*, one of three orchestral *Images* written between 1906 and 1912 (the other two being *Gigues* and *Rondes de Printemps*), and in 1907 he completed the *Images* for piano, which he had begun in 1905. The 24 *Préludes* for piano (completed in 1913) were begun in 1910, and in 1911 Debussy wrote his incidental music for Gabriele D'Annunzio's mystery play, *Le Martyre de Saint Sébastien*. *Jeux* (*Games*), a "tennis" ballet with choreography by Waslav Nijinsky, was completed in 1912 and presented by Sergei Diaghilev in 1913.

The outbreak of World War I found Debussy seriously ill from cancer, of which there had been indications since about 1909. Nevertheless, during 1914 he composed the *Six Épigraphe Antiques* for piano duet, and in 1915 he wrote the *Douze Études* for piano, *En Blanc et Noir* for two pianos, the Sonata for Cello and Piano, and the Sonata for Flute, Viola, and Harp. His last composition, the Sonata for Violin and Piano, was completed in the spring of 1917.

Debussy's musical style began in Massenet-like sentiment, evolved through sensuous impressionism characterized by great harmonic freedom, and ended in classical concision. His piano pieces, orchestral works, songs, and *Pelléas et Mélisande* have won unquestioned inclusion in the canon of great music, and his liberating influence on harmony and rhythm is universally recognized.

Consult Vallas, Léon, *Claude Debussy, His Life and Works*, tr. from the French by Maire and Grace O'Brien (New York 1933); Lockspeiser, Edward, *Debussy*, 3d ed. (New York 1949); Suarès, André, *Debussy* (Paris 1949).

HERBERT WEINSTOCK.

DEBYE, dê-bî', Peter (Joseph Wilhelm), Dutch-American physiochemist; b. Maastricht, Netherlands, March 24, 1884. He was educated as an electrical engineer in the technical school at Aachen, and received his Ph.D. at the University of Munich. In 1911 he became professor of theoretical physics at Zürich. Subsequently he taught at the universities of Utrecht and Göttingen, becoming director of the physical institute at Leipzig in 1927. From 1935 to 1940 he was director of the Kaiser Wilhelm Institut für Physik at Berlin. Debye left Germany for the United States in 1940, becoming professor of chemistry and department chairman at Cornell in the same year. He was awarded the 1936 Nobel Prize in Chemistry for his investigations of the structure of molecules.

DECADENTS, dê-kâ'dents or dêk'â-dents, a loosely connected group of 19th century European writers, who were numbered among the extremists in the reaction against naturalism. The name seems to have been an allusion to the decline of the Roman Empire; it was an epithet flung at, and proudly adopted by, a group of French poets about 1885, whose work was being published in various ephemeral reviews—one of which, appearing in 1886, was named *Le Décadent*. After a few years of more or less independent existence, this group merged with the

larger movement now known as symbolism; decadent, therefore, is still sometimes used as equivalent to symbolist.

In a broader sense the term describes any of those 19th century French writers who saw themselves as members of a civilization that was declining after many centuries of culture, and who, believing that their situation paralleled the late stages of Graeco-Roman civilization, gloried in playing their appointed parts, declaring that the beauty of the sunset is no less than that of the sunrise—some, however, longing for the age of innocence, others taking a masochistic pleasure in contemplating the decline, still others looking forward to the rejuvenating approach of the barbarians. Traces of this historical thesis appear in works by Charles Baudelaire, Stéphane Mallarmé, and Paul Verlaine, to name only three.

But their mode of life and work, rather than any historical approach, came to distinguish the decadents—their hypersensitivity, their restless seeking after artificial excitement, the dissolute often perverted morals that instead of concealing they flaunted as proof of their superiority. Thus the name came to describe a much larger group, all those writers of 19th century Europe who partook unwillingly of placid times and burgeoning materialism, who opposed vehemently a photographic realism that focused its attention on the everyday and mediocre, and who reacted to redress the balance—in the right direction but to excess, seeking a renewal of inspiration in sensuality, even deliberately in degeneracy. Aesthetically the decadents preferred the exotic and artificial, maintaining that art, being human artifice, rejects nature. Characteristically their work embodied the morbid and macabre expression of human emotions, the abnormal, the erotic, the neurotic—Edgar Allan Poe, it should be noted, exercised a direct formative influence on both Baudelaire and Mallarmé.

Among the host of French writers who, on the basis of the foregoing, may be described as decadents—either because of their mode of life or their selection of subject matter—perhaps the best known, besides Baudelaire, Mallarmé and Verlaine, were P. A. M. Villiers de L'Isle-Adam, Arthur Rimbaud, Joris Karl Huysmans, and Pierre Louÿs. Huysmans portrayed the decadent par excellence—restless, bored, despising his times, disgusted with his own personality, ceaselessly in search of the rare and perverse in sensation—in the hero of his novel *À rebours* (1884; Eng. tr. *Against the Grain*, 1922), the aristocrat Des Esseintes, a character that was partly autobiographical, partly modeled on two contemporaries, King Louis II of Bavaria and the poet Comte Robert de Montesquiou-Fezensac.

Outside France the movement took somewhat different forms and was less vigorous. In England there had been native forerunners—Coleridge, Byron, De Quincey, and more immediately Swinburne and Walter Pater. Here the great decadents were Oscar Wilde, whose *Picture of Dorian Gray* (1891) bears the impress of Des Esseintes; the poet Ernest Dowson; and the illustrator Aubrey Beardsley, art editor of the short-lived but influential *Yellow Book*. Arthur Symonds, who translated Baudelaire and Louÿs, helped spread the movement in England. The German Stefan George in *Algabal* (1892) depicted the morbid pleasures of Heliogabalus in artificial underground gardens; Gabriele D'Annunzio's *Il Piacere* (1889; Eng. tr. *The Child of Pleasure*,

1898) was an Italian echo of Huysmans' *A rebours*; and the decadents were briefly influential among the *modernistas* of the Spanish-speaking world.

Consult Kahn, Gustave, *Symbolistes et décadents* (Paris 1902); Van Roosbroeck, G. L., *The Legend of the Decadents* (New York 1927); Praz, Mario, *Romantic Agony*, tr. by A. Davidson (New York 1933).

DECALCOMANIA, dê-kāl-kô-mā'nî-â (popularly DECAL), a design printed on specially prepared paper for transference to another surface. Decalcomanias became popular in Europe during the middle of the 19th century and were perfected mainly in Germany and, after World War I, in the United States. They are widely used to replace expensive painting or lettering by hand.

Since the paper must be dipped in water or some other solvent to liberate the decalcomania before application, it must be very absorbent. But the paper must also receive a good undercoating so that the colors, which are applied by lithography, silk screen, or other process, will not penetrate its surface—if duplex paper is used, the colors are applied to a sheet of tissue which, in the completed decalcomania, faces the regular paper. Usually a coat of adhesive is also part of the decalcomania, and no separate adhesive is required.

Basically there are three kinds of decalcomanias. The "face up" type is meant to be slid off the paper onto a surface, and its colors are built up on top of an undercoat. The "face down" type is applied directly; its colors are put on in reverse, followed by a backing coat. In the third or combination type, a face up design is applied on top of a face down design. The combination type may be applied to glass and seen or read from either side.

Decalcomanias have innumerable uses: on windows and windshields; to decorate homes and home furnishings; as decorations and labels on manufactured goods; as revenue or tax stamps; and not least, as amusements for children and to decorate Easter eggs. Special types are made for application to flexible surfaces, like rubber and cloth. The decoration of ceramics with intricate floral patterns which otherwise would have to be hand painted is another important use. In this process the decalcomania is applied to fired glazed ware which has been sized with an adhesive mixture.

DECALOGUE, dêk'â-lôg (Gr. δέκα, ten + λόγος, word), a term meaning "Ten Words" (used in Exodus 34:28 and Deuteronomy 10:4), which designates the short code of religious and moral law also known as the TEN COMMANDMENTS. Scholars often call this the Ethical Decalogue to distinguish it from another known as the Ritual Decalogue, first recognized by J. W. von Goethe, in Exodus 34:14-26.

Content.—The Ethical Decalogue is preserved in two slightly different wordings in Exodus 20:2-17 and in Deuteronomy 5:6-21. While there is no essential variation so far as the obligations are concerned, there are two major differences between the texts. First, in Exodus 20:9-11 the reason offered for the celebration of the Sabbath is of a strictly theological nature and appears to be associated with man's worship of God the Creator (note the allusion to the drama of creation as told in Genesis 1), whereas in Deuteronomy 5:13-15 the Sabbatic rest is justified by

a concern for humaneness, inspired by the memory of Israel's slavery in Egypt. Second, in Deuteronomy 5:21 the prohibition against covetousness singles out "thy neighbor's wife" from "thy neighbor's house," thereby ascribing to womanhood a position of dignity incompatible with that of mere chattel or property. In Exodus 20:17, on the contrary, the wife is mentioned after "thy neighbor's house," together with the male slave, the female slave, the ox, and the ass.

Division.—Shorn of their elaborating commentaries, the Ten Commandments may appear as follows (Exodus 20:2-17):

- I. I am Yahweh, thy God, who brought thee out of the house of slaves. Thou shalt have no other gods before me (vss. 2-3).
- II. Thou shalt not make unto thee a graven image (vs. 4a).
- III. Thou shalt not take the name of Yahweh thy God in vain (vs. 7a).
- IV. Remember the Sabbath day, to make it holy (vs. 8).
- V. Honor thy father and thy mother (vs. 12a).
- VI. Thou shalt not kill (vs. 13).
- VII. Thou shalt not commit adultery (vs. 14).
- VIII. Thou shalt not steal (vs. 15).
- IX. Thou shalt not bear false witness against thy neighbor (vs. 16).
- X. Thou shalt not covet (vs. 17a).

The foregoing arrangement, which most modern exegetes would approve, is not, however, that presented by all traditions. According to modern Judaism, verse 2 is the First Word or Commandment, verses 3 to 6 form the Second, and verse 17 is the Tenth. For the Greek and all Protestant churches except the Lutheran, and according to the earliest witness of Flavius Josephus and Philo Judaeus (Philo of Alexandria), verse 2 is the preface, verse 3 is the First Commandment, verses 4 to 6 form the Second Commandment, and verse 17 is the Tenth Commandment. The Roman Catholics and Lutherans consider verses 3 to 6 the Second Commandment and divide verse 17 into the Ninth and Tenth commandments. According to this arrangement, the prohibition against making cultic images is not considered the Second Commandment but an elaboration of the First. In dividing verse 17, a distinction is made between coveting a neighbor's wife and coveting his property—a distinction possible only on the basis of the wording in Deuteronomy (5:21). Most modern scholars regard verse 17, which is not divided in the Hebrew manuscripts, in the ancient versions, nor in the Jewish tradition, as forming a single prohibition.

Date and Origin.—The final edition of the Pentateuch presents the Decalogue as spoken by God to Moses on Mount Sinai and as written on two tables of stone (whence "the tables of testimony" or "the tables of the Covenant"), which Moses shattered when he learned the people's apostasy (Exodus 32:19). Traditions concerning the rewriting of the Ten Words are confused and conflicting (compare the accounts in Exodus 34:1, 27-28; 40:20; Deuteronomy 4:13).

Modern scholars differ widely on the question of the origin and date of the Decalogue. At the end of the 19th century the majority of scholars tended to consider it a late codification of the teaching of prophets of the 8th or 7th centuries B.C. This view was opposed by independent critics during the first half of the 20th century, and scholarship appears to be returning to the traditional thesis of a Mosaic origin.

The debate turns mainly on these points:

(1) It has been observed that references to cattle and to sojourners within the gates (Exodus

20:10) as well as to oxen and asses (vs. 17) imply an agrarian and sedentary civilization, which does not accord with the situation of the Hebrews in the wilderness at the time of Moses.

This argument, however, is no longer recognized as valid, since the references in question belong not to the 10 "lapidary words," or pithy commands, but to their expository elaboration, which by common agreement does indeed reflect a later period than that of the original document.

(2) In accordance with the view that Israel's religion evolved from a ritual emphasis to an ethical one, it has been maintained that the Ethical Decalogue of Exodus 20 and Deuteronomy 5 can hardly be anterior to the Ritual Decalogue of Exodus 34, and that since this last reflects an agrarian and sedentary mode of existence, the Ethical Decalogue cannot be Mosaic.

But this evolutionary sequence is no longer held to be historically accurate, for not only do many documents of the ancient Near East anterior to Moses display a highly ethical concern, but the religion of Israel becomes not less ritualistic but more so in the course of the Biblical centuries from the pre-Exilic to the post-Exilic periods—as evidenced by the development of the festivals, the sacrificial system, and the priestly hierarchy.

(3) The antiquity of the Second Commandment (against the making of a "graven" or "hewn" image) has been questioned, but it can no longer be seriously disputed. It fits the simplicity of nomadic life in the wilderness, whereas the condemnation of a "molten" image might indeed imply a higher level of technological civilization.

Scholars who deny the antiquity of the Second Commandment on the ground that images of the Deity were apparently permitted in early Israel (Judges 18:30-31) ignore the fact that one cannot challenge the existence of a legal prescription simply because its precepts are violated, especially in a time of polytheistic syncretism.

(4) It has been held that the command to observe the Sabbath is the creation of the 7th or 6th centuries B.C. While the question of its origin is still obscure, there is no reason to doubt an earlier date. Indeed, the sudden application of the Sabbath to an agrarian society would be much more difficult to explain than the maintenance of a hallowed practice inherited from nomadic times, when a day of rest would create no economic hardship.

(5) It has been maintained that the prohibition against covetousness reveals a sophisticated—hence, modern!—psychology since it distinguishes between intention and deed. Such subtle mentality, however, is fully compatible with the earliest traditions of the Hebrews (as shown, for example, in Genesis 4:7; 6:5; 37:11; Joshua 7:21).

Conclusion.—In its lapidary form, the Decalogue appears to have constituted the minimal requirement of the Covenantal bond (Exodus 19:5). It reflects a remarkably noncultic type of religion, and the relationship of man to God and of man to man is described—albeit in a predominantly negative form—with a profound sense of the inwardness and homogeneity of worship and ethics. It points to the integrity and wholeness of the early Hebrew religion and to its emphasis on social responsibility.

Consult Rowley, H. H., "Moses and the Decalogue," *Bulletin of the John Rylands Library*, vol. 34, No. 1 (Manchester, England, 1951).

SAMUEL TERRIEN,
Union Theological Seminary.

DECAMERON, The, dē-kām'ēr-ōn, by Giovanni Boccaccio, was composed as a whole probably shortly after 1348. The work, a masterpiece of Italian literature, is made up of 100 tales contained in a fictitious framework story which relates the time and occasion of the telling of them. To escape the devastation of the plague of 1348 in the city of Florence, seven young ladies and three young men repair to villas and pleasant gardens above the city, there to pass the time as pleasantly as may be. To do this every one agrees to tell a story on each of 10 days (whence the title of the work) under the rule of a "queen" or "king" elected from among their number. Each day, moreover, is given over to some special kind of story, such as "stories of love or of adventure beginning in adversity and ending happily" or "stories of tricks played by wives on husbands." Each day of storytelling ends with a dance and a dance song.

The result is a world of human comedy of the greatest variety, well deserving the renown of the work throughout Europe from the Renaissance to our own day. Many of the stories are familiar tales which Boccaccio has simply recast in his masterful style—a style which became the model of Italian prose for more than two centuries thereafter and was imitated in several other languages and literatures of western Europe.

It is noteworthy that such a work as this could appear but a generation after Dante's *Divine Comedy*, for in spirit it stands at the greatest remove from the medieval poem. Francesco De Sanctis (1817-1883), the Italian critic, remarked in turning from one work to the other, that in the *Decameron* one finds the Middle Ages not only denied but ridiculed. Certainly the world of the *Decameron* is one in which no intervention of divine grace is envisaged, a world from which all serious concern for salvation is absent. Human wit and the forces of natural instinct prevail in the motivation of the characters generally, and the art by which they are presented in their various situations and actions is quite unconcerned with the moral edification of the reader. Boccaccio seems to have been aware that such an art and such a world of human action stood defenceless before the religious conscience of his time. He therefore constructed the framework story to surround his art so conceived and to justify it by establishing a mood and attitude toward it in the reader. The book is dedicated to "idle ladies" as to a kind of ideal public, and thus to the idle moment of a reader who wishes only to be amused. Taken in the spirit in which the work is thus offered, the *Decameron* has the ever-fresh vitality of great fiction. See also BOCCACCIO, GIOVANNI. ITALY—Literature (Boccaccio and the Lesser 14th Century Writers).

CHARLES S. SINGLETON,
Department of Romance Languages and Literature,
Harvard University.

DE CAMP, de kamp', Joseph Rodefer, American painter: b. Cincinnati, Ohio, Nov. 5, 1858; d. Boca Grande, Fla., Feb. 11, 1923. He was a student of Frank Duveneck at the Cincinnati School of Design and as one of a group he went with Duveneck to Europe to finish his training, studying for a time at the Royal Academy in Munich. Returning to the United States in 1880, De Camp set up his studio in Boston and became a teacher in the school of the Boston Museum of Fine Arts. He won the Temple gold medal of the

Pennsylvania Academy of Fine Arts in 1909; honorable mention at the Paris Exposition of 1900 for a *Woman Drying Her Hair*, and a gold medal at the Saint Louis Exposition in 1904. He created great enthusiasm in Berlin in 1910 with *An Interior* and *A Lady Playing a Lute*. He painted a great many prominent Americans and was awarded the Beck portrait medal at Philadelphia in 1911. Notable works are in the Cincinnati and Worcester museums.

DECAMPS, dē-kān', **Alexandre Gabriel**, French painter: b. Paris, France, March 3, 1803; d. Fontainebleau, Aug. 22, 1860. He was educated in the studio of Abel de Pujol. When a young man he made a journey to the East, and returned from thence with a collection of sketches, from which he afterward produced some of his finest pictures. Among the more celebrated of these are *The Grand Bazaar*; *Relieving Guard at Smyrna*; *A Turkish Café*; *Turkish Children Going Out of School*; and *Arab Horsemen Passing a Ford*. Of pictures of another class are *The Shepherd and His Flock Overtaken by a Storm*; *An Italian Village*; *The Hawking Party*; *Spaniards Playing at Cards*; *Don Quixote and Sancho Panza*. Decamps also produced some historical and sacred pictures of a high order of art, including the *Defeat of the Cimbri*; *The Miraculous Draught of Fishes*; *Joseph Sold by His Brethren*; *The Finding of Moses*, and others. The leading merits of this painter are great originality of conception and vigor of expression, with a wonderful skill in the treatment of light and shade. He was made chevalier of the Legion of Honor in 1839. He was extremely sensitive and conscious of his departure from classical tradition, and he abandoned art for many years.

DE CANDOLIE. See **CANDOLLE**.

DECAPODA. See **CRUSTACEA**.

DECAPOLIS, The, dē-kāp'ō-lis, a region in the north of ancient Palestine, partly west but largely east of the Jordan River, extending about 35 miles both east and southeast from the Sea of Galilee to the Arabian Desert; so named from a league of 10 cities mostly within this district. Of these cities ancient authors have varying lists, which consequently create varied limits for the area; even so Damascus (q.v.) and Philadelphia (now Amman, capital of the kingdom of Jordan), which occur in all lists, lie beyond the Decapolis proper—taking the Galilean Sea as a base, the one is about 55 miles northeast and the other is about 50 miles southeast from its ends. Thus, including the section west of the river, the cities would be in a territory about 105 miles long on a north-south axis and about 60 miles wide in an east-west direction.

The earliest list is Pliny's, who (77 A.D.) claims that most writers concur on the following cities (*Natural History*, v. 16[18]. 74): Canatha (or Kanatha, now Kanawat or Kanat), Damascus, Dios (or Dion, now Adun or Dahim), Gadara (q.v.), Galasa (or Gerasa, now Jerash, q.v.), Hippos (now Susie), Pella (q.v., now Fahil), Philadelphia, Rhaphana (or Raphana), Scythopolis (now Beisan or Baisan or Bethshean). The fullest list is Ptolemy's, who (c.150 A.D.) omits Rhaphana and adds these nine (*Geography*, v. 14. 18): Abila (now Abil), Abila

Lysanias (now Abila), Adra (now Edrei), Capitolias, Gadara, Heliopolis (now Baalbek, q.v.), Hina (now Hine), Saana, Samulis (now Semak or Semmak or Sumeike). Some of the Ptolemaic additions were in the larger territory of Coele-Syria (q.v.), but their inclusion in the confederation had no effect on the name. (For a similar phenomenon see **CENTUMVIRS**, where a numerical increase made no alteration in title.)

During his conquest of Syria (333-332 B.C.) Alexander the Great established military colonies in strategic sites, whither immigrants from Greece soon flocked, and after his death (323 B.C.) other veterans and pioneers joined the Syrian colonists. Many dwelt in the district afterward called Decapolis, where they occupied old cities or built new towns, of which some were settled by 200 B.C. and others were founded later. As long as the Seleucids (see **SELEUCIDS**) controlled Syria effectively as Alexander's successors, these Greek foundations were safe. But when the Maccabees (q.v.) had succeeded in their revolt (168-142 B.C.) and extended their rule (141-64 B.C.), some of these towns lost to the Jews what internal independence they had had under the Seleucids. The Roman conquest of Syria under Pompey the Great and their organization of it into a province (64-63 B.C.) restored municipal freedom to these cities, which under successive provincial governors also enjoyed the right of coinage and some control over the adjacent countryside, though, of course, they were subject to taxation, to military service in men and matériel, and to dictation in political and legal affairs. Such favor as they received was probably a reward for their aid to the Romans in resisting raids from the nomads of the desert and in reducing Jewish revolts.

The association of these cities into the league of Decapolis between Pompey's conquest and before Herod the Great's death (4 B.C.)—presumably nearer the latter than the former—was possibly for protection against Semitic influences (whether outside or within Syria) hostile to them and probably for improvement of commercial relations with one another. It is unknown what kind of constitution the confederacy had and how long the league lasted, but the cities' most flourishing period appears on archaeological (architectural, epigraphical, numismatical) evidence to have been in the age of the Antonine emperors (138-193 A.D.). The confederation's capital was Scythopolis, which, though the league's only city west of the Jordan, strategically commanded the western outlet of three roads over that river and through eastern Palestine as well as the eastern end of communications with cities on the Mediterranean coast. The other towns lay either along the three roads or on the great highway which these join—the century-old route of Moslem pilgrims from Damascus to Mecca via Medina.

Except for Damascus (the world's oldest continuously inhabited site) and Amman (the ancient Philadelphia, where some remains still are remarked) the cities of the Decapolis are in ruins, but even the ruined condition of such sites as have been identified testifies to a vigorous life: amphitheatres, theaters, arches, aqueducts, baths, bazaars, bridges, colonnaded streets, temples, shrines, altars, and tombs. In literature Gadara alone produced Menippus (q.v.) the satirist (fl. 260 B.C.), Meleager the epigrammatist (c.140-c.70 B.C.), Philodemus (q.v.) the philosopher (c.110-c.35 B.C.), Theodorus the rhetorician (fl.

1 AD.). And it was at Gadara that devils drove the swine into the Galilean Sea (Mark 5:1-20; Matthew 8:28-34; Luke 8:26-39).

Consult Smith, Sir George A., *The Historical Geography of the Holy Land*, 25th ed., chap. 29 (New York 1932); Smith, Sir George A., and Bartholomew, John, eds., *Historical Atlas of the Holy Land*, rev. ed., plates 16-22, 26, 41-44 (London 1936); Wright, G. E., and Filson, F. V., eds., *The Westminster Historical Atlas to the Bible*, plates 12 and 14 (Philadelphia 1945).

P. R. COLEMAN-NORTON.

DE CASSERES, dē-kās'ēr-ēs, Benjamin, American writer: b. Philadelphia, Pa., 1873; d. New York City, Dec. 6, 1945. In 1903 he joined the staff of the New York *Herald*, continuing until 1919, except in 1906-1907 when he founded and helped edit *El Diario* in Mexico City. From 1922 to 1933 he was drama critic for *Arts and Decorations*, and in 1934 became a columnist and literary editor for Hearst newspapers in New York City. Among his writings are: *The Shadow-Eater* (poems 1915); *Chameleon—Being the Book of My Selves* (1922); *Mirrors of New York* (1925); *The Superman in America* (1929); *Mencken and Shaw* (1930); *The Muse of Lies* (1936); and *Don Marquis* (1938). His writings were translated and introduced into France by Remy de Gourmont.

DECATHLON, dē-kāth'lōn, a sports contest consisting of 10 track and field events. Each participant in the decathlon competes in all the events, which are as follows: 400-meter flat race, running broad jump, putting the shot, running high jump, 100-meter flat race, throwing the discus, 110-meter hurdle race, pole vaulting, throwing the javelin, and 1,500-meter flat race. The decathlon is the chief composite track and field contest of the modern Olympic games.

DECATUR, dē-kā'tēr, Stephen, American commodore: b. Newport, R. I., 1752; d. Philadelphia, Pa., Nov. 14, 1808. During the war of the American Revolution he commanded several privateers and acquired some reputation by the capture of English ships. At the commencement of hostilities with France in 1798 he was appointed to the command of the *Delaware*, of 20 guns, in which ship he cruised during the years 1798-1799 on the American coast and in the West Indies, capturing at different times the French privateers *Le Croyable* of 14, and *Marsuin* of 10, guns. In 1800 he commanded a squadron of 13 sail on the Guadeloupe station, the *Philadelphia*, a frigate of 38 guns, being his flagship.

STEPHEN DECATUR, American naval officer, son of the preceding: b. Sinepuxent, Md., Jan. 5, 1779; d. Bladensburg, Md., March 22, 1820. He was educated at the Episcopal Academy and at the University of Pennsylvania. Refusing a clerical life, in 1796 he entered the countinghouse of a firm of shipowners. In 1797 he got out the keel pieces of the frigate *United States* and was on her when she was launched, the first ship of the United States Navy. Through the instrumentality of Commodore John Barry he was appointed a midshipman in the navy by President John Adams, April 30, 1798. He cruised in the West Indies during the French War in the *United States*, taking part in various minor naval actions. Such was his aptitude and ability that he was commissioned lieutenant, May 21, 1799. At the outbreak of the Tripolitan War, in command of the schooner *Enterprise*, he captured the bomb

ketch *Mastico*, Dec. 23, 1803. In this ketch, renamed the *Intrepid*, he destroyed the frigate *Philadelphia* in the harbor of Tripoli by a singularly bold stroke.

On Aug. 3, 1804 Decatur commanded the American gunboats in their attack on the Tripolitan flotilla. He captured two gunboats by the most desperate hand-to-hand fighting in a battle which has been called the "biggest little fight in history," and well merits the name. He took part in four other attacks on Tripoli with his usual distinction. For the burning of the *Philadelphia* he was commissioned a captain, and at the age of 25 was placed in command of the frigate *Constitution*. At the close of the war he returned home, having divided with Commodore Edward Preble the honors of the campaign.

On March 8, 1806 he married Susan Wheeler of Norfolk, Va. He had no children, and his wife survived him many years. At the outbreak of the War of 1812 he was in command of the *United States*, in whose building he had assisted, on which he had been launched, and in which he had made his first cruise. On Oct. 25, 1812 the *United States* captured the British frigate *Macedonian*, which was dismasted and almost cut to pieces. She lost 35 per cent of her complement, or 89 killed or mortally wounded, and 15 severely wounded, besides many others slightly wounded. On the American ship seven were killed or mortally wounded, and five severely wounded. The *United States* was practically intact. The weather remained favorable and by strenuous work for two weeks the *Macedonian* was patched up and brought back to New York, the only trophy of the great frigate actions of the war that remained afloat. The disparity in force in favor of the *United States* was about 7 to 5, in damage inflicted about 9 to 1.

After being blockaded in New London for a year Decatur took command of the frigate *President*. On the night of Jan. 14, 1815, in the midst of a howling gale, he put to sea from New York. On the morning of the 15th, off the eastern end of Long Island, he fell in with a British squadron of five heavy ships. Every effort was made to escape, but in the afternoon the *President* was brought to by the frigate *Endymion*. A running fight ensued until 6 o'clock, when Decatur attempted to lay the *Endymion* aboard, hoping to capture her, scuttle the *President* and escape on the British ship, but the *Endymion* had the heels of the *President* and avoided the maneuver. For two hours the vessels sailed side by side in furious conflict. At the end of this time the *Endymion* was entirely silenced. She had been fought to a standstill. Decatur could not take possession for fear of the other ships. He tried running again, but the *President* had been severely injured in the battle, and about 11 o'clock she was overhauled by two British frigates, which ran alongside and opened fire. The British flagship was also in range and the last ship was coming up rapidly. The *President* had lost 24 killed and 55 wounded, including most of her deck officers. Decatur himself had been twice wounded. Further conflict with two fresh ships was hopeless. Decatur reluctantly struck his flag and surrendered to the commodore of the squadron.

After the close of the war he was placed in command of a squadron and sent to the Barbary States to exact reparation for injuries and to enforce treaties of peace. His squadron cap-

tured the Algerine frigate *Meshouda* and the brig *Estedio* on June 17 and 19. On June 30 1815 he exacted submission and peace from the Dey of Algiers; on July 26 the same from the Bey of Tunis; and on August 7 the same from the Bashaw of Tripoli. The treaties were made at the mouth of the cannon and indemnities demanded were paid immediately.

In 1816 he was appointed naval commissioner. On March 22, 1820, he was killed in a duel with Commodore James Barron. The cause of this duel arose from certain strictures which Decatur passed on Barron. Barron had been suspended for his conduct on the *Chesapeake*, when she was attacked by the *Leopard* in 1807. He had not returned to the United States during the War of 1812 but had remained in Europe and came back after hostilities were at an end. When he applied for reinstatement after the close of the war Decatur opposed his request. He need not have entertained Barron's challenge save for a too nice sense of honor. He is buried in Saint Peter's church-yard, Philadelphia.

Loyalty to his country was the very breath of life to Decatur. Our judgment does not entirely approve the ethic significance of his famous sentiment, "My country—may she ever be right, but, right or wrong, my country"; but our affections tend to make the sentiment our own. There is a ring of sincerity in the words and in him which wins us in spite of all.

His nephew, STEPHEN, b. 1815; d. 1876, was also a commodore in the United States Navy.

CYRUS TOWNSEND BRADY.

Consult Mackenzie, A. S., *Life of Decatur* (Boston 1846); Anthony, F. W., *Decatur* (New York 1931)

DECATUR, city, Alabama, Morgan County seat; altitude 573 feet; on the Tennessee River; on the Southern, and the Louisville and Nashville railroads; 85 miles northwest of Birmingham. It has manufactures of hosiery, steel barges, textile tire fabric, and a diversified list of other products. Founded in 1820 as a town, and named for Commodore Stephen Decatur (q.v.), it became a city in 1826; in 1927 it was enlarged by annexation of Albany (formerly New Decatur) and Fairview. Pop. (1930) 15,593; (1940) 16,604; (1950) 19,974.

DECATUR, city, Georgia, and De Kalb County seat; altitude 1,049 feet; 6 miles east of Atlanta; on the Georgia Railroad. Decatur is a residential suburb, and has no industries; in the surrounding area, truck farming and dairying are carried on. Decatur is the seat of Agnes Scott College, for women, and of Columbia Theological Seminary (Presbyterian), for men. The town was incorporated in 1823. In July 1864, a battle of the Civil War was fought here. On one corner of the courthouse square is a monument honoring Stephen Decatur, the naval hero for whom the town was named. Pop. (1930) 13,276; (1940) 16,561; (1950) 21,635.

DECATUR, city, Illinois, Macon County seat; altitude 682 feet; on Lake Decatur, which was brought into being by damming the Sangamon River; 168 miles southwest of Chicago; on the Illinois Central; Baltimore and Ohio; Pennsylvania; and Wabash railroads; served also by the electrified lines of the Illinois Terminal Railroad; has an airport. Centrally located within the state, Decatur is a railroad and highway

focusing point; a manufacturing community, and a college town. Its physical environment is that of the Illinois prairies and the corn belt—in which the soybean also has come to be extensively grown. Trade center for a territory with a 50-mile radius, Decatur has also a very active industrial life, with a diversified list of products. Industrial development began in the 1850's, after the advent of the railroads. Railroad shops are a prime source of employment here, and the manufacture of starch and of corn syrup, and the processing of soybeans, are prominent among the city's industries. Other of its industrial products are bottling machinery, articles of brass, plumbing fixtures, electric light fixtures, and pressure valves. There are packing houses in the city, and some coal mines near by. Here are a Carnegie library, excellent recreational and cultural facilities, and well organized social and civic agencies. The Decatur Civic Art Institute houses varied collections, some of them local in execution or subject. In Fairview Park (180 acres) is the Lincoln Log Cabin Courthouse, Macon County's first courthouse, restored, and removed from its original site. Decatur is the seat of James Millikin University (q.v.). In this city, in 1866, was organized the first post of the Grand Army of the Republic (q.v.). Here, too, in May of 1860, Lincoln received his first endorsement by a party convention for the Presidential nomination. Decatur was incorporated as a city in 1836. The city government is administered by a mayor and four commissioners. Pop. (1950) 66,269.

DECATUR, city, Indiana, Adams County seat; altitude 803 feet; on the St. Mary's River; and on the Pennsylvania; the Erie; and the New York, Chicago and St. Louis railroads; 22 miles southeast of Fort Wayne. It is in a farming section, and the making of soybean products and processing of food products are outstanding activities. It also produces saddlery, small motors, and foundry castings. Decatur became a city in 1885; has mayor and council, and owns the water, light, and power systems. Pop. (1930) 5,156; (1940) 5,861; (1950) 7,271.

DECATUR, village, Michigan, in Van Buren County; altitude 779 feet; on the Michigan Central Railroad, 25 miles southwest of Kalamazoo. Industries are few, but it is a trading center for the surrounding agricultural area. It was settled in 1848, incorporated in 1861, and has a mayor and council government. Pop. (1950) 1,664.

DECATUR, town, Texas, and Wise County seat; altitude 1,097 feet; 40 miles northwest of Fort Worth; on the Fort Worth and Denver City Railroad (Burlington). Decatur is the trade center and shipping point for a dairy farming and agricultural area. The principal crops are cotton, corn, and wheat. Decatur Baptist College is located here. The town has a mayor and council. Pop. (1940) 2,578; (1950) 2,992.

DECAZES, dē-kāz', Duc *Élie*, French statesman and jurist: b. Saint Martin du Laye, Gironde, Sept. 28, 1780; d. Decazeville, France, Oct. 25, 1860. He gained the confidence of Louis Bonaparte, king of Holland, whom he served even after his abdication in 1810; but joined the cause of the Bourbons in 1814 and under the second restoration discharged the duties of Prefect of Police at Paris with marked ability. In 1818 he

became minister of the interior, and in November 1819 premier. After the assassination in 1820 of Charles Ferdinand de Bourbon, duc de Berry, he resigned. He was made a duke and served as ambassador to England for some months during 1820–1821. He was grand referendary of the house of peers from 1834 to 1848. He developed the mining area of Aveyron, and gave his name to Decazeville.

DECEIT, in the most technical legal sense, a deliberate misrepresentation resulting in injury to another. The essential elements are representation, falsity, knowledge of the falsity of the representation, intent that it shall be acted upon, actual misleading effect upon the person to whom it is made, and injury resulting from his reliance on it. In a broader sense, as for example in laws providing for the disharment of attorneys, the term may mean any misleading statement, suggestion, or concealment.

RICHARD L. HIRSHBERG.

DECEMBER, the 12th month of the year, from the Latin *decem*, 10, because in the earliest Roman calendar it was the 10th month. In December the sun enters the tropic of Capricorn and passes the winter solstice.

DECEMBRISTS (Russian *Dekabristy*), a name given to the members of various secret societies which were formed in Russia during the reign of Alexander I. These societies were organized by young liberal members of the Czarist Imperial Guard, and were at various times named the Society of Salvation (*Soyuz spaseniya*), Society of Welfare (*Soyuz Blagodenstvniya*), Northern Union, and Southern Union. They aimed to establish a constitutional monarchy by revolutionary means in Russia, and to liberate the Russian serfs. In general, the members were idealists, who grossly overestimated the strength of their support. When Czar Alexander I died in 1825, his oldest brother, Constantine, refused the throne, which passed by default to Alexander's younger brother, Nicholas. The latter, however, had not been informed in advance that he would succeed Alexander, and was at first uncertain as to his legal right to the succession. The Decembrists took advantage of this confused situation to revolt. Leading a group of 2,000 soldiers of the Imperial Guard in St. Petersburg, they demanded "Constantine and a Constitution" for Russia. This uprising of Dec. 26, 1825 was almost like a comic opera. The rebels had no popular support, and their soldiers were so ignorant that many thought "Constitution" was Constantine's wife. Nicholas suppressed the uprising the day it began, and punished severely all the ringleaders. Though seemingly unimportant, the Decembrist revolt had several far-reaching results. First, it was the last of Czarist Russia's palace revolutions. Second, thenceforth the Russian nobility were discredited as a democratic revolutionary force. Third, the Decembrists' ideals lived on, stimulating further rebellion.

ELLSWORTH RAYMOND.

DECEMVIRS, *dê-sém'vêrz*, in ancient Rome 10 magistrates or officials with various functions, of which some were temporary and others permanent. They were of four types.

1. Decemvirs for writing laws (*decemviri legibus scribundis*) were patrician commissioners

elected to codify the laws and to govern the state during the year 451 B.C., when all other magistrates were suspended. Since the codification was considered incomplete, new decemvirs—of whom only Appius Claudius (See **CLAUDIUS**) belonged to the former board—with two plebeians added, were chosen for 450 B.C. The code, called the Twelve Tables (See **TWELVE TABLES**, **LAW OF THE**) then was completed, but before its ratification in 449 B.C. the commissioners, who had behaved tyrannically, were deposed.

2. Decemvirs for conducting religious rites (*decemviri sacris faciundis*) guarded and interpreted the Sibylline Books (q.v.). Originally only two (*duoviri*), the commission's plenum was enlarged to 10 in 367 B.C. and finally to 15 (*quindecimviri*) between 82 and 79 B.C. Membership was for life; vacancies were filled by appointment until 104 B.C., when election was substituted.

3. Decemvirs for judging lawsuits (*decemviri stlitibus iudicandis*) were minor magistrates who decided cases involving citizenship. Traditionally they were elected as early as 449 B.C., but the first certain reference to them is in about 139 B.C. In the imperial era, beginning in 27 B.C., they presided over panels of centumvirs (see **CENTUMVIRS**).

4. Decemvirs for giving, assigning, adjudging lands (*decemviri agris dandis, assignandis, iudicandis*) were appointed under an agrarian law for founding a colony and for distributing plots among the colonists.

DECENTRALIZATION, in business and industry, is the geographical and operational dispersement of a firm's operations. Businesses are often concentrated in one area to take advantage of the so-called economies of scale. As an organization grows it becomes able to utilize heavy and expensive equipment, to purchase supplies and materials in bulk, and to employ highly skilled specialists. After a certain scale of operations has been reached, however, diseconomies of scale set in. This means that the return per dollar of investment declines. Surveys have shown that there is an optimum size of plant, varying among the different industries; giant operations do not earn as high a rate of profit as medium-sized plants. The chief reason for these diseconomies of scale appears to be the inordinate burden placed on top management. In an effort to avoid diseconomies, industry has resorted to decentralization. As a result, transportation costs have been lowered, overtaxing of local labor supplies has been eliminated, and scattered raw material sources have been more efficiently utilized. Decentralization of operations has been extensively employed in the automobile assembly field in recent years, and in retail food chains. For the firm, decentralization means avoiding a complete shutdown when a local disturbance occurs, as well as greater productive efficiency. For the economy as a whole, it means a better balance of industry and trade throughout the nation. Shortly after World War II, over 80 per cent of the industrial production of the United States was still concentrated in slightly over 20 per cent of the land area. With the advent of industrial bombing as a major component of military strategy, industrial dispersion has become vital to the maintenance of the flow of goods from the production line in case of war.

WILLIAM KINNARD.

DECENTRALIZATION, in political science, the condition of a state or other political system in which governmental authority is distributed among many organs with defined geographic or functional competence according to relatively permanent constitutional or legislative provisions. The term is also used for the process by which such a condition develops. Compared to France or Great Britain, the United States has a highly decentralized government. Governmental authority is divided among the federal government and the 48 states by a constitution difficult to amend. Within the federal government, legislative, executive, and judicial powers are distributed by the Constitution among the Congress, the president, and the courts, and there is a similar functional distribution of power by the constitutions of each of the states. In both the federal government and the states, "Independent Regulatory Commissions" exercise considerable independent power. Furthermore, in each of the states, the constitution or relatively permanent legislation accords considerable home rule to municipalities and other local bodies. The general direction of movement in the United States, however, has been toward greater centralization.

In Great Britain governmental power has in principle been centralized in "the King in Parliament," but, as problems have become more complex, delegations of power to local and functional organs have become relatively permanent, and in the case of the overseas empire, delegations of power to the dominions have become complete. The British Empire, now called the Commonwealth, has therefore been undergoing a process of decentralization, in contrast to the direction of movement in the United States, which today is much more centralized than it was under the Articles of Confederation.

In a broad sense, all western countries, leaving, as they do, many functions (religion, business, journalism, and even education) to nongovernmental agencies, are decentralized as compared with totalitarian states like the Soviet Union, in which functional centralization reaches an extreme. At the opposite extreme, the international community, with governmental power divided among the United Nations, a dozen specialized agencies, several regional arrangements, and 80 sovereign states, manifests great decentralization. It is, however, more centralized than it was a century ago.

QUINCY WRIGHT,

Professor of International Law, University of Chicago.

DECEPTION, Tests of. The oldest account of a test of deception is to be found in I Kings 3:16-28. King Solomon determined which of two women was lying when he directed that the child, whom each claimed, should be divided in half. Throughout the centuries various techniques have been used to detect whether or not the accused were telling the truth or lying. In *Hamlet* the guilt of King Claudius is demonstrated by having a group of strolling players act out a crime analogous to the murder of Hamlet's father (Act III, Scene 2). Traditional police methods in the detection of lying have made use of a variety of techniques. The accused may be questioned for hours on end, and devices and subterfuges may be employed to trap him in a web of lies.

Contemporary scientific tests of deception

have their origins in two sources. First, there is the free association test developed by Carl Gustav Jung, in which words relating to the crime are intermixed with neutral words, and the accused is to respond to each with the word most closely associated in his mind. Length of reaction time, signs of emotional disturbance, and other indicators may reveal whether or not the accused is trying to employ deception. Secondly, there have been various experiments with instruments which register physiological changes during a planned interview with the accused. Alterations in the inspiration-expiration ratio, the tendency to perspire, changes in heart rhythm, and tremors, may be objectively recorded by means of apparatus. Short-acting barbiturates have also been used. Scopolamine, for example, is popularly known as a "truth serum," since it may often release those inhibitions which a guilty person would normally exert when being questioned by law-enforcement officers. Mild dosages of sodium amyltal have been used for a similar purpose.

There is no question but that physiological disturbances are concomitants of strong emotions, and that a guilty person may be unable to inhibit these alterations, even though he continues to attempt deception through verbal behavior. On the other hand, an innocent person may be equally disturbed in physiological functions if questioned vigorously by the police. Hence, a considerable amount of discussion has arisen over the validity and the ethics of these techniques for indicating deception. In some European countries the evidence from these deception tests may be used in courts of law to strengthen the case for the prosecution. In certain states in the United States an accused person may volunteer to take deception tests in order to establish innocence before a case is presented to a court of law. In fact, deception tests have come into rather wide use during the early stages of police investigation of crimes, when it is important to eliminate as quickly as possible those who fail to betray by physiological upheavals any knowledge of the crime in question. Under the Bill of Rights, however, no one suspected of a crime may be made to testify against himself. Consequently, the courts of law in the United States of America and in Canada take a very cautious position with reference to deception tests. Much more experimental work needs to be done before any scientifically tenable opinions can be formed about the validity of these interesting procedures.

Consult Larson, John A., Haney, George W., and Keeler, Leonarde, *Lying and Its Detection* (Chicago 1932).

P. L. HARRIMAN.

DE CESARE, dâ chă'zà-râ, Carlo, Italian economist and political leader: b. Spinazzola, Bari Province, Italy, Nov. 12, 1824; d. Rome, Oct. 13, 1882. He served as a deputy to the national parliament in 1861 and 1866. During 1868-1869 he was secretary general of the ministry of agriculture, during 1867-1870 inspector general of the bank of issue, and beginning in 1870 counsellor of the *Corte dei conti*. He became a senator in 1876. His *Manuale popolare di economia pubblica* was published in two volumes in 1865. Among his many other works are *Il mondo civile e industriale nel secolo XIX* (1857), *Il passato, il presente e l'avvenire della pubblica amministrazione in Italia* (1865), *La politica, l'economia e la morale dei moderni Italiani* (1869), and *La Germania moderna* (1872; 2d ed. 1874).

DECHAMPS, dē-shān', Adolphe, Belgian statesman: b. Melle, Belgium, June 17, 1807; d. near Brussels, July 19, 1875. Early in his life he was a disciple of Félicité Robert de Lamennais; later he was a leader of the Belgian Catholic Party. He was elected to the chamber of representatives in 1834. In 1842 he became governor of Luxembourg, in 1843 minister of public works, and in 1845 minister of foreign affairs. He wrote *Le second Empire* (1859), *La France et l'Allemagne* (1865), *L'Ecole dans ses rapports avec l'Eglise, l'Etat et la Liberté* (1868), and *Le Prince de Bismarck et l'entrevue des trois empereurs* (1873).

DECHEN, dēk'ēn, Heinrich von, German geologist: b. Berlin, March 25, 1800; d. Bonn, Feb. 15, 1889. After studying at the University of Berlin he turned to practical mining. He took a position as adviser at the Bonn bureau of mines in 1828, returned to Berlin in 1831, and in 1834 assumed a professorship at the university there. He went to Bonn again in 1841 to become director of the bureau of mines, a position which he held until his retirement in 1864. During the period 1838-1855 he edited the *Archiv für Mineralogie, Geognosie, Bergbau, und Hüttenkunde*, and was associated in that work with Karl Johann Bernhard Karsten. His principal publication was a geological map of Rhenish Prussia and Westphalia, issued in 35 sections on the scale of 1:80,000 and accompanied by two volumes of explanatory text (1855-1882). Among his other works is *Geognostischer Führer in das Siebengebirge am Rhein* (1861), establishing the delimitations of Permian and Triassic strata.

DECHOLIN. See **DEHYDROCHLORIC ACID**.

DECIDUOUS, dē-sid'ū-ūs (Latin *deciduus*, from *decidere*, to fall off), in botany, a term applied to various plant organs, particularly leaves, to indicate their annual or periodic fall. When the calyx of a flower falls with the corolla it is called deciduous; when it falls on the expansion of the flower it is called caducous. Deciduous trees are those which for the most part lose and renew leaves annually. (See **DURATION**.) In zoology deciduous phenomena include the antlers of deer.

DECIDUOUS TEETH. See **TEETH**.

DECIMAL COINAGE, a monetary system in which the basic unit of currency is divided into decimal fractions, usually one hundredths. In the notation of decimal coins, the denominator is ordinarily omitted, and to indicate its value a point is placed to the left of as many figures of the numerator as there are ciphers in the denominator—thus $\frac{25}{100}$ is rendered as .25. Should there not be a sufficient number of figures in the numerator, the deficiency is made up by prefixing ciphers to the numerator, as in .05 for $\frac{5}{100}$. In the United States and Canada, the dollar consists of 100 cents, and fractional coins are issued in various denominations as small as one cent and as large as 50 cents. Likewise in France, the franc is divided into 100 centimes. By contrast, the British pound sterling (worth about \$2.80 in United States currency) consists of 20 shillings or 240 pence.

DECIMAL SYSTEM. See **METRIC SYSTEM**.

DECIMATION, in war, the selection of the 10th man of a corps by lot for punishment, as in case of a mutiny. It was early practiced by the Romans. Sometimes every 10th man has been executed; sometimes only one man of each company, the 10th in order, as was the case when the Saxons mutinied against Gebhard Leberecht von Blücher before the Battle of Waterloo. The practice was followed by Robert Devereux, 2d earl of Essex, at Dublin (1599), by the Austrians at Leipzig (1642), and by the French at Trèves (1675). The term is often loosely used for the destruction of a great number of people, as of an army or of the inhabitants of a country.

DECIN, dyě'chēn (Ger. *Tetschen*), city, Czechoslovakia, located in the northern part of Bohemia, on the Labe (Elbe) River, across from Podmokly, near the border of Saxony. Besides being a river port, Děčín is a railroad junction and manufacturing center, producing such products as soap, drugs, perfumes, and textiles. Pop. (1947) 10,639; urban area, 30,753.

DECIPHERMENT. As early as the 4th century B.C., the traditions of the once great oriental empires, such as the Babylonian, Assyrian, Egyptian, and Hittite, were succumbing to the pressure of Greek civilization; and with the advent of Islam, even the memory of their languages was blotted out entirely. The history of the decipherment of their extant writing begins in the 19th century, when Europe began to develop a scientific interest in the ancestry of its own civilization.

Philologists are interested in the decipherment of unknown writings and languages solely for the purpose of enriching our historical knowledge; in that, they differ from the professional cryptologists, whose aim is to decipher writings used for the purpose of secret communication. The work of philologists in deciphering dead writings and languages can be considered easier or more difficult than the decipherment of secret writings and languages, depending on the point of view from which one looks at the problem. It is easier because the dead writings and languages convey ideas by direct methods and do not try to lay obstacles in the way of the reader; it is more difficult because the decipherer usually has to work with types of writings and languages which are either new or little known.

The degree of difficulty in the decipherment of dead writings and languages depends on many factors. If a bilingual inscription exists, the decipherment can usually be achieved in a very short time. There have been very few cases, however, in which the decipherers were fortunate enough to operate with bilinguals. In all other cases they had to rely on elements of quasi-bilingual character, such as the structure of the inscription, the typology of the writing, the relationship of the language to known languages, and the context of situation.

The easiest to decipher is an unknown writing used for a known language or for a language closely related to a known language. This is called in cryptology the simple substitution cipher, whose principle is the substitution of an unknown graphic element for a known one. In this class, the easiest has been the decipherment of alphabetic writings, such as Phoenician or Ugaritic, which consists of 22-30 signs. A slightly more difficult problem to crack was the Cypriote syllabary,

which consists of some 56 signs used for the Greek language on the island of Cyprus. The same type of problem is presented by the Cretan writing of the Linear B variety—apparently used for Greek—now in process of decipherment.

Much more difficult is the decipherment of an unknown language in a known writing. This is what is known in cryptology as code, whose principle is the substitution of an unknown linguistic element for a known one. As an illustration we may mention Etruscan, written in the perfectly legible Latin alphabet, but in a language which seems to have no relatives in the known groups of languages. Until such a language is found the ultimate decipherment of Etruscan seems hopeless.

Naturally, the most difficult is the problem of decipherment of unknown languages in unknown writings. This is what may be called enciphered code, used rather rarely in the field of cryptology, but very common among ancient writings. As an illustration, the successful decipherment of the Egyptian hieroglyphic, Mesopotamian cuneiform, and Hittite hieroglyphic may be cited. Proto-Elamite in southern Iran and proto-Indic in the Indus Valley, both from the third millennium B.C., remain to be deciphered.

I. J. GELB,

Professor, The Oriental Institute, University of Chicago.

DECIUS, dē'shī-ūs, **Gaius Messius Quintus Trajanus**, Roman emperor: b. Budalia, Pannonia, 201 A.D.; d. 251 A.D. He was proclaimed emperor by his troops while undertaking, at the command of Philip the Arabian, the suppression of an uprising in Moesia, and was accepted as emperor by the Roman Senate after the death of Philip. He sought to restore the state religion, and zealously persecuted the Christians. He perished in a bloody battle near Abricium (in present Dobruja, Rumania) against the Goths, through the treachery of Gaius Vibius Trebonianus Gallus, who succeeded him as emperor.

DECIUS JUBELLIUS, jū-bēl'li-ūs, Campanian general: d. Rome, 271 B.C. When Pyrrhus king of Epirus, invaded southern Italy (281 B.C.) to aid some of the Greek cities there in their war with Rome, the Romans garrisoned 4,000 Campanian auxiliaries, commanded by Decius, in Rhegium, which had pleaded for Roman protection. Pretending that the Rhegines were plotting with Pyrrhus, Decius and his men, amid frightful atrocities, seized the city (279 B.C.). Soon afterward Decius contracted an ocular disease and summoned a physician from Messana (in Sicily). This Physician, unknown to Decius, was a Rhegine, and in revenge for the tyrant's cruelties he prescribed a lotion, with instructions to continue its use, however painful. Decius obeyed and became blind. After Pyrrhus' death the Romans captured Rhegium (271 B.C.), beheaded about 350 Campanian survivors, and imprisoned Decius in Rome, where he soon committed suicide.

DECIUS MUS, mūs, **Publius**, pūb'li-ūs, three Roman consuls (father, son, and grandson). All three were said to have "devoted" themselves to destruction in battle and charged into the enemy's ranks to certain death—the eldest Decius against the Latins in Campania (340 B.C.), the second against the Gauls at Sentinum (295 B.C.), and the youngest against Pyrrhus, king of Epi-

rus, at Ausculum Apulum (279 B.C.). Modern scholars believe, however, that if any such "devotion" (*devotio*) took place at all, it should be credited to the second Decius only.

DECKEN, dēk'ēn, **Karl Klaus von der**, German explorer: b. Kotzen, Brandenburg, Germany, Aug. 8, 1833; d. Oct. 2, 1865. He served in the Hannoverian army until 1860, and then sailed for east Africa, where he began explorations. In 1861 he reached Mount Kilimanjaro, and in 1862, with Otto Kersten, ascended it to a height of nearly 14,000 feet. He was the first to attempt exploration of the African interior by following the course of the Juba River. During this venture he was killed by Somalis.

Consult Kersten, Otto, *Baron K.K.v.d. Deckens Reisen in Ostafrika*, 4 vols. (Leipzig 1869 79).

DECKER, Thomas. See DEKKER, THOMAS.

DECLARATION, in law, an oral or written statement, usually one made out of court and introduced in evidence as part of the testimony of a witness or as a document. The word is frequently used synonymously with admission (q.v.). The law relating to declarations is primarily concerned with the question of whether certain statements are admissible in evidence or must be excluded under the general rule that "hearsay" (statements made out of court) cannot be considered as competent proof of the facts asserted. The answer to the question of admissibility depends upon the content of the statement and the person by whom it was made. Generally, statements which are disadvantageous to the party making them (such statements being known as admissions) are admissible against the declarant. "Declarations against interest" are similar to admissions, except that they are made against the interest of a person other than a party to a lawsuit in which they are introduced. Such declarations will usually be received in evidence if the declarant has died, become insane, or for some other reason is not available to testify in person. Many declarations are admissible in evidence under other exceptions to the rule excluding "hearsay," even though they may be incidentally favorable to the interest of the person making them. Entries in a shop or account book, for example, are acceptable as evidence of goods sold and delivered or services performed in most American courts, in spite of the English common-law rule that, in general, a person cannot make evidence for himself. Another example of a self-serving declaration which is admissible in evidence is a spontaneous exclamation of pain and suffering.

The declarations of a deceased person are not admissible simply because he is unavailable to testify in person, but they may be received in evidence under some circumstances. In addition to admitting statements against the pecuniary or proprietary interest of a deceased declarant, the courts will usually consider the declarations of a person since deceased on questions of boundaries, on the declarant's citizenship, on matters of family history and relationship, and as indications of testamentary capacity. A statement made when a declarant is near death and conscious of the fact, known as a dying declaration, is not competent evidence in most cases. Such a declaration may be received in evidence, however, in criminal prosecutions for homicide or for abortion

where the death of the victim is an element of the offense.

RICHARD L. HIRSHBERG.

DECLARATION OF INDEPENDENCE, United States. The steps by which the extralegal *de facto* governments of the colonies during the early Revolution—the Committees of Correspondence and Safety—were turned into formal legislative bodies, are detailed under CONGRESS, CONTINENTAL; CONVENTIONS, CONSTITUTIONAL.

The first Congress, of 1774, assumed neither executive nor legislative authority. The second, early in its existence (July 6, 1775), formally disclaimed any purpose of separation. The first half-unconscious step towards independence was the appointment, November 1775, of five commissioners to maintain communications with friends of the colonies in "Great Britain, Ireland, or elsewhere." Thomas Paine's *Common Sense*, urging independence as inevitable, and the sooner the better, appeared Jan. 10, 1776; it had wide influence and unlocked many tongues. So general was the concurrence with Paine's views that, in fear of them, three of the middle colonies—New Jersey, Pennsylvania and Maryland—instructed their delegates to vote against any such measure. The other two, New York and Delaware, were bitterly divided and their delegates took no part in forwarding the independence movement. South Carolina was also hostile, contrary to its usual habit of eager initiative—probably from fear of England's stirring up the great Indian confederations against the South, as was afterward done. But events pushed them on. British naval captures led Congress, March 23, to declare all British vessels lawful prize; and on April 6 it opened all United States ports to all vessels other than British. This was an act of absolute sovereignty, acknowledged or not. The colonies, under instructions from Congress, were steadily forming state governments; and Congress May 10 and 15 recommended all the remaining ones to take the same step, which of course involved making their common union independent also. John Adams was the foremost agent in all this work. The North Carolina convention April 12 resolved to "concur with those in the other colonies in declaring independence." On May 15 Virginia instructed her delegates in Congress to move a "Declaration of Independence"; and on June 7 Richard Henry Lee made a motion to that effect in Congress, which was seconded by John Adams. On June 8 and 10 this was debated in Committee of the Whole; but action was postponed to July 1, as some delegations were averse and others were awaiting instructions.

On June 10 a committee of five was appointed to draw up the Declaration: Thomas Jefferson of Virginia, John Adams of Massachusetts, Benjamin Franklin of Pennsylvania, Roger Sherman of Connecticut and Robert R. Livingston of New York. The task of composition was assigned to Jefferson by the committee; the latter and Congress made many changes, but mostly by omission rather than alteration of wording, so that the language is practically all Jefferson's. The chief cancellation was the indictment of the king for having carried on the slave trade, and refusing to allow American legislatures to suppress it. South Carolina and Georgia, which were actively carrying on the slave trade them-

selves, would not permit this indictment to stand; and too much Northern wealth had been earned by the trade for the Northern states to insist on its passage, which would have made foreign nations dubious of their sincerity.

The Declaration was reported June 28. On July 1 as fixed, debate was begun afresh on Lee's resolution. New Jersey and Maryland had reversed their instructions meantime. In Committee of the Whole that evening, nine states voted for it; Pennsylvania and South Carolina voted against it (but the latter delegates, possibly after hearing from the South, offered without instructions to vote yes if it would make a unanimous vote), Delaware was divided, and New York refused to vote. The "yea" Delaware delegate, Thomas McKean, sent an urgent message to the third, Caesar Rodney, then on a political trip in southern Delaware, to come on at once; Rodney traveled 80 miles the next day, arrived in the evening and insured Delaware's affirmative vote. Pennsylvania also joined the majority; and since this left only the abstaining New York delegates out of the voting, the South Carolina members voted yes. This carried the motion that "these united colonies are and of right ought to be free and independent states, that they are absolved from all allegiance to the British Crown, and that all political connection between them and the state of Great Britain is and ought to be totally dissolved," by 12 yeas and no negative vote. On the 3d the Declaration was taken up, and as amended was passed on the evening of the 4th. The anniversary of the fact of independence is therefore the 2d; that of the adoption of the specific document in which it was proclaimed to the world is the 4th, as celebrated. The usual statement that it was "signed" by the members at this time, however, is incorrect; it was signed by the president and secretary, whose signatures only were borne by the printed copies sent out. The journals of Congress did not enter the Declaration, but left a blank for it, which was afterward filled in and the signatures taken from the engrossed copy. On the 9th the New York convention ratified it, and the delegates gave in their formal adherence on the 15th; it was then, as entitled, "The Unanimous Declaration of the Thirteen United States of America." Six additional Pennsylvania members also recorded a formal vote on the 20th. On July 19 Congress passed a resolution that it should be engrossed on parchment, and on August 2 it was signed by 53 members present; Elbridge Gerry of Massachusetts, McKean of Delaware and Matthew Thornton of New Hampshire were empowered by their legislatures to sign later. Thornton, who was not a member of Congress at the time of adoption, signed on November 4.

The parchment with the original signatures was deposited with the Department of State when the government was organized in 1789. In 1823 John Quincy Adams had a copper-plate facsimile made, to give copies to the signers and their heirs; but unfortunately it ruined the original. The wet sheet pressed on the face drew out the ink so that the signatures have become illegible and almost invisible, and the text partially so; and after being shown for many years only on special occasions, in 1894 it was definitely sealed up in a steel case to keep it from light and air. From 1841 to 1877 it was in the Patent Office. In 1954 the original was in the National Archives Building.

The unanimous Declaration of the thirteen united States of America.

[illegible][illegible]

A facsimile reproduction of the Declaration of Independence of the United States.

Connecticut: Roger Sherman, Samuel Huntington, William Williams, Oliver Wolcott.

Delaware: Caesar Rodney, George Read,
Thomas McKean.

Maryland: Samuel Chase, William Paca.
Thomas Stone, Charles Carroll of Carrollton.

¹ Signed the Declaration as president of the Congress rather than as a representative of the state of Massachusetts.

DECLARATION OF INDULGENCE

Virginia: George Wythe, Richard Henry Lee, Thomas Jefferson, Benjamin Harrison, Thomas Nelson, Jr., Francis Lightfoot Lee, Carter Braxton.

North Carolina: William Hooper, Joseph Hewes, John Penn.

South Carolina: Edward Rutledge, Thomas Heyward, Jr., Thomas Lynch, Jr., Arthur Middleton.

Georgia: Button Gwinnett, Lyman Hall, George Walton.

It may be noted that several of these were not members of Congress when the Declaration was passed.

The Declaration, as agreed to, follows:

IN CONGRESS, JULY 4, 1776

THE UNANIMOUS DECLARATION of the thirteen united STATES OF AMERICA.

WHEN in the Course of human events it becomes necessary for one people to dissolve the political bands which have connected them with another, and to assume among the powers of the earth, the separate and equal station to which the Laws of Nature and of Nature's God entitle them, a decent respect to the opinions of mankind requires that they should declare the causes which impel them to the separation.—We hold these truths to be self-evident, that all men are created equal, that they are endowed by their Creator with certain unalienable Rights, that among these are Life, Liberty and the pursuit of Happiness.—That to secure these rights, Governments are instituted among Men, deriving their just powers from the consent of the governed,—That whenever any Form of Government becomes destructive of these ends, it is the Right of the People to alter or to abolish it, and to institute new Government, laying its foundation on such principles and organizing its powers in such form, as to them shall seem most likely to effect their Safety and Happiness. Prudence, indeed, will dictate that Governments long established should not be changed for light and transient causes; and accordingly all experience hath shewn that mankind are more disposed to suffer, while evils are sufferable, than to right themselves by abolishing the forms to which they are accustomed. But when a long train of abuses and usurpations, pursuing invariably the same Object evinces a design to reduce them under absolute Despotism, it is their right, it is their duty, to throw off such Government, and to provide new Guards for their future security.—Such has been the patient sufferance of these Colonies; and such is now the necessity which constrains them to alter their former Systems of Government. The history of the present King of Great Britain is a history of repeated injuries and usurpations, all having in direct object the establishment of an absolute Tyranny over these States. To prove this, let Facts be submitted to a candid world.—He has refused his Assent to Laws, the most wholesome and necessary for the public good.—He has forbidden his Governors to pass Laws of immediate and pressing importance, unless suspended in their operation till his Assent should be obtained; and when so suspended, he has utterly neglected to attend to them.—He has refused to pass other Laws for the accommodation of large districts of people, unless those people would relinquish the right of Representation in the Legislature, a right inestimable to them and formidable to tyrants only.—He has called together legislative bodies at places unusual, uncomfortable, and distant from the depository of their public Records, for the sole purpose of fatiguing them into compliance with his measures.—He has dissolved Representative Houses repeatedly, for opposing with manly firmness his invasions on the rights of the people.—He has refused for a long time, after such dissolutions, to cause others to be elected; whereby the Legislative powers, incapable of Annihilation, have returned to the People at large for their exercise; the State remaining in the mean time exposed to all the dangers of invasion from without, and convulsions within.—He has endeavoured to prevent the population of these States; for that purpose obstructing the Laws for Naturalization of Foreigners; refusing to pass others to encourage their migrations hither, and raising the conditions of new Appropriations of Lands.—He has obstructed the Administration of Justice, by refusing his Assent to Laws for establishing Judiciary powers.—He has made Judges dependent on his Will alone, for the tenure of their offices, and the amount and payment of their salaries.—He has erected a multitude of New Offices, and sent hither swarms of Officers to harass our people, and eat out their substance. He has kept among us, in times of peace, Standing Armies without the Consent of our legislatures.—He has affected to render the Military independent of and superior to the Civil power.—He has combined with others to subject us to a

jurisdiction foreign to our constitution, and unacknowledged by our laws; giving his Assent to their Acts of pretended Legislation:—For quartering large bodies of armed troops among us:—For protecting them, by a mock Trial, from punishment for any Murders which they should commit on the Inhabitants of these States:—For cutting off our Trade with all parts of the world:—For imposing Taxes on us without our Consent:—For depriving us in many cases, of the benefits of Trial by Jury:—For transporting us beyond Seas to be tried for pretended offences:—For abolishing the free System of English Laws in a neighbouring Province, establishing therein an Arbitrary government, and enlarging its Boundaries so as to render it at once an example and fit instrument for introducing the same absolute rule into these Colonies:—For taking away our Charters, abolishing our most valuable Laws and altering fundamentally the Forms of our Governments:—For suspending our own Legislatures, and declaring themselves invested with power to legislate for us in all cases whatsoever.—He has abdicated Government here, by declaring us out of his Protection and waging War against us.—He has plundered our seas, ravaged our Coasts, burnt our towns, and destroyed the lives of our people.—He is at this time transporting large Armies of foreign Mercenaries to compleat the works of death, desolation and tyranny, already begun with circumstances of Cruelty & perfidy scarcely paralleled in the most barbarous ages, and totally unworthy the Head of a civilized nation.—He has constrained our fellow Citizens taken Captive on the high Seas to bear Arms against their Country, to become the executioners of their friends and Brethren, or to fall themselves by their Hands.—He has excited domestic insurrections amongst us, and has endeavoured to bring on the inhabitants of our frontiers, the merciless Indian Savages, whose known rule of warfare, is an undistinguished destruction of all ages, sexes and conditions. In every stage of these Oppressions We have Petitioned for Redress in the most humble terms: Our repeated Petitions have been answered only by repeated injury. A Prince, whose character is thus marked by every act which may define a Tyrant, is unfit to be the ruler of a free people. Nor have We been wanting in attentions to our British brethren. We have warned them from time to time of attempts by their legislature to extend an unwarrantable jurisdiction over us. We have reminded them of the circumstances of our emigration and settlement here. We have appealed to their native justice and magnanimity, and we have conjured them by the ties of our common kindred to disavow these usurpations, which would inevitably interrupt our connections and correspondence. They too have been deaf to the voice of justice and of consanguinity. We must, therefore, acquiesce in the necessity, which denounces our Separation, and hold them, as we hold the rest of mankind, Enemies in War, in Peace Friends.—

WE, THEREFORE, the Representatives of the UNITED STATES OF AMERICA, in General Congress, Assembled, appealing to the Supreme Judge of the world for the rectitude of our intentions, do, in the Name, and by Authority of the good People of these Colonies, solemnly publish and declare, That these United Colonies are, and of Right ought to be FREE and INDEPENDENT STATES; that they are Absolved from all Allegiance to the British Crown, and that all political connection between them and the State of Great Britain, is and ought to be totally dissolved; and that as Free and Independent States, they have full Power to levy War, conclude Peace, contract Alliances, establish Commerce, and to do all other Acts and Things which Independent States may of right do.—And for the support of this Declaration, with a firm reliance on the protection of divine Providence, we mutually pledge to each other our Lives, our Fortunes and our sacred Honor.

John Hancock

Button Gwinnett	Th. Jefferson	Frans. Lewis
Lyman Hall	Benj. Harrison	Lewis Morris
Geo. Walton	Thos. Nelson, Jr.	Richd. Stockton
Wm. Hooper	Francis Lightfoot	Jno. Witherspoon
Joseph Hewes	Lee	Fras. Hopkinson
John Penn	Carter Braxton	John Hart
Edward Rutledge	Robt. Morris	Abra. Clark
Thos. Heyward,	Benjamin Rush	Josiah Bartlett
Jun.	Benj. Franklin	Wm. Whipple
Thomas Lynch,	John Morton	Saml. Adams
Jun.	Geo. Clymer	John Adams
Arthur Middleton	Jas. Smith	Robt. Treat Paine
Samuel Chase	Geo. Taylor	Elbridge Gerry
Wm. Paca	James Wilson	Step. Hopkins
Thos. Stone	Geo. Ross	William Ellery
Charles Carrol of	Caesar Rodney	Roger Sherman
Carrollton	Geo. Read	Sam. Huntington
George Wythe	Tho. M. Kean	Wm. Williams
Richard Henry	Wm. Floyd	Oliver Wolcott
Lee	Phil. Livingston	Matthew Thornton

DECLARATION OF INDULGENCE, a title for two conspicuous grants of toleration to

Catholics and Nonconformists made by Charles II (March 15, 1672) and James II (April 4, 1687). The restoration of monarchy in 1660 had also involved a restoration of the Anglican Church, whose monopoly of religion was confirmed by Parliament's severe enactments against Nonconformists. Roman Catholics, called Recusants, had been under severe legal disabilities since the time of Elizabeth I. Charles professed a desire for a general toleration as early as 1662, asserting that he felt kindly toward Catholics for their loyalty to his father and to him, and that he wished no revenge upon the sectarians who had martyred Charles I; but his strongly Anglican (Cavalier) Parliament obstinately opposed toleration and, furthermore, undertook to limit the king's discretion by refusing to grant him enough money to manage the state. When, in 1670, Charles sought and obtained financial aid from Louis XIV of France, he promised that monarch England's support in a war against the Dutch, and at the same time promised relief for English Catholics from penal laws, and even agreed to announce his own conversion to Catholicism—though this last might require military aid from France. This was the substance of a secret treaty, masked by a less secret treaty of alliance.

The Indulgence proclaimed in 1672 was the first open test of the royal policy. The inclusion of Nonconformists in the grant of toleration was not productive of any expressions of gratitude, while the challenge to the Anglicans was resented equally by ecclesiasts and members of Parliament. The resultant uproar was such that the king's whole design was thwarted. He was forced not only to withdraw the declaration but to admit that he had no right to issue it; and he had to approve the first Test Act (1673) by which Catholics were barred from holding office under the crown. A key to subsequent religious and political turmoil was the revelation about this time of the conversion to Catholicism of James, duke of York, the king's brother and heir to the throne. Attempts in Parliament to legislate a Protestant succession were thwarted by Charles but only after a period of severe repression of Catholics and anti-Catholic hysteria which brought England close to another civil war. Charles became a Catholic on his death-bed in 1685.

James, after peacefully acceding to the throne, embarked upon a course which provoked a repetition of the events of 1672–1673, except that in this instance there was no agreement with France. The Indulgence proclaimed in 1687 noted that persecution had not achieved its purpose and had "ever been directly contrary to our inclination," and had led to declines in trade and population. Therefore, in order to secure people in the things they value most, religion and property, the king claimed prerogative right to grant to Catholics and to Nonconformists the liberty to "meet and serve God after their own way and manner." He further indicated his intention to dispense Catholics from the first and second (1678) Test Acts, as he might choose to admit individuals among them to his service. Full pardon was proclaimed for all prior violations of penal laws and acts of uniformity. The Declaration was reissued with further justifications on April 27, 1688. The refusal of the Anglican clergy to read the Indulgence from their pulpits, leading to the trial (and acquittal) of seven

bishops for sedition, was supported by the aristocracy; and both were represented in the invitation to William, count of Nassau, to come over and save Protestantism in England. Even so, the favorable response to this Indulgence by the Nonconformists was such that it became necessary to promise them a measure of toleration if the movement to overthrow James was to be successful. Thus, the royal declaration led indirectly to the Toleration Act of 1689 which, with the Bill of Rights and the new Coronation Oath, became a part of the revolutionary settlement.

Consult Browning, Andrew, ed., *English Historical Documents 1660–1714* (New York 1954); Bryant, Arthur, ed., *Letters, Speeches, and Declarations of King Charles II* (London 1935); Turner, Francis C., *James II* (New York 1948).

JOHN T. FARRELL,
Professor of History, The Catholic University of America.

DECLARATION OF LONDON, a diplomatic instrument signed by representatives of the 10 principal naval countries at an international conference held in London, Dec. 4, 1908, to Feb. 26, 1909, to codify the laws of maritime warfare. Such a codification had been initiated in the armed neutralities of 1780 and 1800, in the Declaration of Paris of 1856, and in the Hague Conference of 1907. While the latter had dealt with certain belligerent rights at sea, the highly controversial problems of neutral rights at sea remained unsettled. A convention had, indeed, been signed for establishing an international prize court with appellate jurisdiction over national prize courts. But states hesitated to ratify this convention until the law which the international prize court would apply was more settled. The Declaration of London was designed to meet this need. In 71 articles it dealt in detail with blockade, contraband, unneutral service, continuous voyage, destruction of neutral prizes, transfer of neutral flag, enemy character, convoy, and resistance to search. In general, it adopted principles favorable to neutral commerce in time of war, which had been increasingly favored during the relatively peaceful 19th century even by powers such as Great Britain, which had traditionally favored extensive belligerent rights at sea. By a preliminary provision, the signatories of the Declaration expressed their agreement that its rules "correspond in substance with the generally recognized principles of international law." Hence in the case of the *Manouba* the Hague Arbitral Tribunal in 1912 decided a controversy concerning the capture of a French merchant vessel carrying Turkish reservists by an Italian warship during the Italo-Turkish War of 1911, and had no hesitancy in applying Article 47 of the Declaration of London on the theory that it was declaratory of customary international law even though it was not binding as a convention, since it had not been ratified by any state.

Nevertheless, opposition to the declaration developed, particularly in Great Britain, on the ground that it modified traditional belligerent rights and would impair the effectiveness of British sea power in time of war. There can be no doubt but that the declaration did impair the capacity of belligerents to expand contraband lists and in some other respects modified traditional belligerent rights. The British government, however, favored ratification and intro-

duced the Naval Prize Bill of 1911 to facilitate ratification of both the prize court convention and the Declaration of London. At the Imperial Conference of that year Foreign Minister Sir Edward Grey gained support for the bill by saying that while some articles were unfavorable to Great Britain, as a whole it would be advantageous. The bill was, however, rejected by the House of Lords, which had become irritated by the pending proposal of the government to limit greatly its legislative powers. As a result, the declaration was never ratified by any state.

On the outbreak of World War I the United States urged all belligerents to accept it for the duration of the war. Germany agreed to do so and so did Great Britain, but with certain provisos dealing especially with contraband lists. As the war went on, successive British orders in council modified the applicability of the declaration until an order of July 7, 1916, abandoned it altogether with the statement that "these rules, while not in all respects improving the safeguards to neutrals, do not provide belligerents with the most effective means of exercising their admitted rights," and "that they could not stand the strain imposed by the test of rapidly changing conditions and tendencies which could not have been foreseen."

The Declaration of London constitutes the high water mark of efforts to assure freedom of the seas to neutrals in time of war. It included principles which states habitually neutral in wars, or states with relatively small naval forces, had urged for centuries, and for which the United States had traditionally stood, except during the period of the American Civil War.

The failure of the declaration was followed by the entry of the United States and many other traditional neutrals into World War I. It was also followed by changes in the technological conditions of naval warfare, and by major changes in international politics. The United States and other traditional neutrals, instead of continuing efforts to assure the freedom to trade with all belligerents, urged a League of Nations based on the principle of denying all trade to the aggressor. While a provision for freedom of the seas had been included in President Wilson's Fourteen Points, this point was abandoned after it became clear that an effective League of Nations would have to be based on different principles in large measure eliminating the concept of neutrality.

When the United States rejected the League of Nations Covenant in 1920 there were proposals to continue the campaign for neutral rights, and efforts to suppress the use of submarines in commercial warfare were made in the Washington Conference of 1922 and in the subsequent Naval Disarmament Conferences of 1930 and 1936. In the Neutrality Act of 1935 the United States abandoned its traditional demand for freedom of the seas, seeking instead to avoid war by isolating United States shipping from zones in the neighborhood of belligerents and from trade in arms, ammunition, and implements of war. This act, however, was presently modified to permit belligerents to trade with the United States on a "cash and carry" basis, a policy favorable to the Allies in World War II, since they dominated the high seas. This was followed by the Lend-Lease Act, more openly favorable to the Allies, but justified by the theory that neutral discrimination against the aggressor was permitted under

the Kellogg-Briand Pact of 1929, to which the United States and all the belligerents were parties. After the United States became a belligerent in World War II there were few neutrals, and general acceptance of the United Nations eliminated freedom of the seas for trade with aggressors. The problems dealt with by the Declaration of London had become in large measure obsolete.

Consult Higgins, A. Pearce, *The Hague Peace Conference and Other International Conferences concerning the Laws and Usages of War* (Cambridge 1909); Cohen, Arthur, *The Declaration of London* (London 1911), Jessup, Philip C., and Deak, Francis, *Neutrality: Its History, Economics and Law*, 4 vols. (New York 1936).

QUINCY WRIGHT,
Professor of International Law, University of Chicago.

DECLARATION OF PARIS, a code of maritime law in time of war, accepting liberal principles of neutral rights which had long been opposed by Great Britain. It was proposed by the representatives of France in 1856 at the Conference of Paris, which met to end the Crimean War. The substance of the declaration was as follows:

- (1) Privateering is and remains abolished.
- (2) The neutral flag covers the enemy's goods, with the exception of contraband of war
- (3) Neutral goods, with the exception of contraband of war, are not liable to capture under the enemy's flag
- (4) Blockades, in order to be binding, must be effective, that is to say, maintained by a force sufficient really to prevent access to the enemy's coastline.

In addition to France, the declaration was accepted by Great Britain, Austria, Prussia, Russia, Turkey, and Sardinia. The United States, although it had long supported the last three rules in the declaration, declined to accept it in 1856 on the ground that unless all capture of private property at sea were abolished, it would have to utilize privateers in case of war because it had no navy. On the outbreak of the Civil War, however, the United States wished to adhere, but as the other parties had recognized the belligerency of the South, they would not permit such action during the war, because, in the circumstances it would have discriminated against the South. Nevertheless, in the Spanish-American War, both belligerents declared their acceptance of the declaration. Although a few maritime countries had not ratified the declaration, its rules were considered binding in customary international law on the outbreak of World War I.

QUINCY WRIGHT.

DECLARATION OF RIGHTS. The Stamp Act Congress (see CONGRESS, CONTINENTAL) of 1765 published a "Declaration of Rights and Grievances of the Colonists of America," protesting against the Stamp Act, and any other effort to tax the colonists while denying them representation in the Parliament which imposed the taxes. The Congress sent a petition to the king, and another to Parliament, claiming the same rights as were enjoyed by Englishmen born within the British Isles. The right of representation was included in these; but instead of petitioning for that right, the Congress urged its obvious impossibility as a reason why the colonists should not be subject to taxation. The Continental Congress of 1774 (See CONGRESS, CON-

TINENTAL) asserted a similar claim in its declaration, as a preliminary to calling a final congress, and the Declaration of Independence begins with a like assertion. The assertion of such rights was considered so vital in written constitutions by men of that age that the strongest objection to the United States Constitution was its omission in this particular, and the storm of amendments that followed its publication (See CONSTITUTIONAL AMENDMENTS) consisted mainly of bills of rights. See also BILL OF RIGHTS.

DECLARATION OF WAR, a public proclamation by which one government declares itself to be at war with another. In the United States, Congress alone has the power to declare war, and when that body votes for war with a foreign power such a measure is considered to be a declaration of war. Thus, the United States was considered to be at war with Germany from 1:18 p.m., April 6, 1917, the moment when President Wilson signed the Congressional resolution, even though the resolution declared that Germany had "committed repeated acts of war against the government and the people of the United States," and that the state of war had therefore been "thrust upon the United States," by the Imperial German government. During the Civil War, the Supreme Court held that the president may recognize a war instituted by another state or a rebellious group against the United States, and at the time of the Korean hostilities it was held that the president may authorize coercive measures initiated by the United Nations in pursuance of the charter, without congressional resolution.

Prior to the Hague Conference of 1907 the practice of giving formal notice before commencing hostilities was not common. In over 100 wars during the 18th and 19th centuries, only about one in ten was preceded by a declaration (Lieut. Col. J. F. Maurice, *Hostilities without Declaration of War from 1700 to 1870*, London 1883). The third Hague Convention of 1907, which is binding upon the United States and most other states of the world, provides as follows:

"Article I. The contracting powers recognize that hostilities between them must not commence without a previous and unequivocal warning, which shall take the form either of a declaration of war, giving reasons, or of an ultimatum with a conditional declaration of war.

"Article II. The state of war should be notified to the neutral powers without delay, and shall not take effect in regard to them until after the receipt of a notification, which may even be made by telegraph. Nevertheless, neutral powers cannot plead the absence of notification if it be established beyond doubt that they were in fact aware of the state of war."

This convention was generally observed on the outbreak of World War I, making it possible to determine for legal purposes the exact moment when war began between each pair of belligerents. There were in that war a total of 57 distinct declarations initiating war between the 25 Allied powers and one or more of the four Central Powers (Quincy Wright, *A Study of War*, Chicago 1942; Table 42 following p. 646).

In earlier wars it was often difficult to determine just when war began. Thus on April 17, 1898, the United States sent an ultimatum to Spain demanding instant withdrawal from Cuba on pain of war. On Spain's rejection of this on

April 20, Congress met and on April 25, 1898, declared that a state of war had existed since April 21. The president had actually authorized a blockade of Cuba on the latter date, thus recognizing that the Spanish action initiated war. The moment when the Russo-Japanese War of 1904 began was similarly uncertain. The Japanese minister on Jan. 13, 1904, presented a note to the Russian government requesting a prompt reply and implying that if there were unreasonable delay hostilities would be commenced by Japan. On February 5, telegraphic instructions were issued to the Japanese minister to announce to the Russian government that Japan had terminated negotiations. On February 8 hostilities began at Port Arthur, but the formal declaration of war was not issued until February 10. It was held by Japanese prize courts that the war began on February 6, when a vessel of the Japanese Navy attacked and captured a vessel of the Russian Volunteer Fleet. This exemplifies the usual rule before the Hague Convention that when no direct notice was given, war began with the first hostile act. In 1854 before the British ambassador had withdrawn from Russia, a British fleet steamed into the Black Sea to compel the retirement of the Russian fleet to Sebastopol. In 1870, however, Bismarck received a formal notice of war from the French chargé, and in 1877 Russia sent a formal notification of war to Turkey.

During World War II declarations of war were generally issued and were generally held to mark the beginning of war. The Japanese attack on Pearl Harbor preceded by several hours the formal declaration of war by the Japanese Empire. American courts have been divided on whether for legal purposes the war began with the Pearl Harbor attack on Dec. 7, 1941, or with the Congressional declaration on December 9.

In recent times the line between peace and war has become blurred by the conventional outlawry of war and the denomination of states engaged in hostilities, not as equal "belligerents," but as "aggressors," "defenders," or "policing powers." Declarations of war have thus tended to have a significance mainly for the domestic law of the issuing power, and not to determine the status of the hostilities in international law. Furthermore, hostilities have frequently occurred without declaration, as the Japanese attacks on China in 1931 and 1937, the German attack on Russia in 1941, and the North Korean attack on South Korea in 1950. In the latter case neither the United Nations nor the 16 members which participated in "sanctions" declared war. (Hersch Lauterpacht, ed., *Annual Digest and Reports of Public International Law Cases, 1943-1945*, pp. 283 ff. London 1949).

QUINCY WRIGHT,
Professor of International Law, University of Chicago.

DECLARATORY ACT, an act passed by the English Parliament on March 17, 1766, accompanying the repeal of the Stamp Act. It asserted the constitutional right of the king, with the advice of Parliament, to bind the colonies by its laws and action "in all cases whatsoever." The colonists were so delighted at the news of the Stamp Act's repeal that they ignored this reassertion of royal and parliamentary supremacy. The act was modeled after the Irish Declaratory Act of 1719.

DECLENSION, dē-klēn'shūn, the change of termination in certain classes of words, in various languages, to indicate the relation in which those words stand toward other words in a sentence. The condition of change to which the words are brought by the several terminations are styled cases (Lat. *casus*) or fallings, for some reason imperfectly understood. The words subject to declension are of the classes noun, adjective, pronoun, article. In the Latin language grammarians generally recognize five declensions, five different modes of forming cases, and to each declinable word they assign six cases, namely, the nominative, genitive (or possessive), dative, accusative (or objective), vocative (or interjectional), and ablative. There is also a locative case, used in the names of cities, and in such forms as *humi*, *domi*. In the plural the nominative and vocative are always of the same form; so, too, are the dative and ablative. The Greek declensions are variously classified, but most generally made three in number and the cases five, as well as two locative cases found in the dialects. The ancient Sanskrit language has eight cases of nouns and the present language of the Finns has 15; but the languages of western Europe derived from Latin—Italian, Spanish, Portuguese, French, and so forth—have dropped the declinational terminations of the Latin, and hence the Latin for “man,” which is declined *homo*, *hominis*, *homini*, *hominem*, *homo*, *homine*, has in those modern languages the one form *homme* in French, *uomo* in Italian, *hombre* in Spanish. The ancient Germanic language, from which English is descended, had declensions; but in our language the only remnants of the ancient forms are the possessive cases of nouns and the objective case of pronouns, I, me; he, him; she, her; they, them. While in the Indo-European languages above cited, as well as in the Semitic tongues, the unity of the word is not destroyed by inflection, in languages like the Turkish, which are styled agglutinative, elements are added in declension which supersede or obscure the individuality of the original word. See also **CASE**; **INFLEXION**.

DECLINATION, dēk-lī-nā'shūn, in astronomy, the distance of a heavenly body from the celestial equator (equinoctial), measured on a great circle passing through the pole and also through the body. It is said to be north or south according as the body is north or south of the equator. Great circles passing through the poles, and cutting the equator at right angles, are called circles of declination. Twenty-four circles of declination, dividing the equator into 24 arcs of 15 degrees each, are called hour circles or horary circles.

DECLINE AND FALL OF THE ROMAN EMPIRE, *The*, a monumental work by Edward Gibbon, the first volume of which appeared in 1776, and the last in 1788. *The Decline and Fall* has been pronounced by many the greatest achievement of human thought and erudition in the department of history. It is a history of the civilized world for 13 centuries, during which paganism was breaking down, and Christianity was superseding it; and so bridges over the chasm between the Old World and the New. It is marked by dignity of style and picturesqueness of narration. The great criticism of the work has always been upon the point of

Gibbon's estimate of the nature and influence of Christianity.

DECLINE OF THE WEST, *The*, by Oswald Spengler (q.v.), one of the controversial books of the early 20th century. Originally published in Germany as *Der Untergang des Abendlandes* in 1918–1922, it was translated into many languages (the English 2-volume version appearing in 1926–1928). Spengler presents a grandiose synthesis of history which ranges from earliest recorded times and embraces many phases of human endeavor (politics, philosophy, the arts, religion, science, mathematics, economics, warfare, and so forth). Spengler recognizes eight major cultures: Egyptian, Mesopotamian, Indian, Chinese, “Classical,” Near Eastern (“Magian”), Mexican, and Western (“Faustian”). A feature of the author's philosophy is his attempt to predict, on the basis of what he insists are chronologically parallel developments in the morphology of the other seven cultures, the inevitable downfall and eventual petrification of the West, that is, Europe and America, within the next two centuries.

DECLINOMETER, dēk-lī-nōm'ē-tēr. The magnetic meridian passing through any place on the earth's surface is a vertical plane whose direction is that in which a magnetic needle, free to move about a vertical axis, comes to rest under the influence of the earth's magnetic force. In general, the magnetic and geographical (or astronomical) meridians are not coincident; the angle between is termed the magnetic declination, or (in nautical phraseology) the variation. It is east or west, according as the magnetic is east or west of the geographical meridian. Any apparatus for the measurement of this angle is termed a declinometer, and consists essentially of a means of ascertaining the two necessary elements—namely, the directions, at the place of observation, of the two meridians. Permanently fixed instruments of this nature are set up in all magnetic observatories.

DECOCTION, dē-kōk'shūn, in pharmacy, a solution of a vegetable principle largely obtained by boiling in water the substance containing the principle. Decoctions are not very much used at the present time.

DECOIC, dē-kō'ik, **ACID**, or **CAPRIC**, kăp'rik, **ACID**, an organic acid having the formula $C_{10}H_{20}O_2$, and occurring in the form of various compounds in butter, coconut oil, fusel oil (from certain sources), Limburg cheese and the fatty matters extracted from the wool of sheep. It is soluble in alcohol and ether, but almost insoluble in cold water. It crystallizes in needles that have a faint odor suggestive of rancid butter, and is prepared by the distillation of oleic acid, or by the oxidation of that acid by nitric acid. The name “capric” has reference to the fancied resemblance of the odor to that of a goat; while “decoic” refers to the 10-carbon atoms that the acid contains.

DECOMPOSITION, *Chemical*, is the separation of the constituents of a body from one another, these constituents being obtained either free or in a new state of combination. Limestone, for example, is decomposed into lime and carbonic acid, oxide of mercury into

mercury and oxygen, by heat. This is known as simple decomposition. In the case of an organic body, it is possible to convert its constituents at once into their simplest states of combination, but it is also possible to obtain a large number of intermediate compounds by regulating the decomposing action. The process by which such bodies are thus decomposed is compound decomposition. A double decomposition is a reaction in which the elements of two substances rearrange themselves to form two new substances, each of which contains elements from each of the old substances. See also REACTION.

DECOMPRESSION. See CAISSON DISEASE.

DECORAH, dē-kōr'ā, city, Iowa, seat of Winnebago County, situated at an altitude of 905 feet, on the Upper Iowa River, and on the Chicago, Milwaukee, St. Paul and Pacific and the Chicago, Rock Island and Pacific railroads, 60 miles north-northeast of Waterloo. It is the trade and processing center for a district raising grain, dairy cattle, and poultry. The city is the seat of Luther College (q.v.), which administers the Norwegian-American Historical Museum, founded in 1933. Half a mile to the north is the largest ice cave in the Midwest. Incorporated in 1857, Decorah is governed by a mayor and council. Pop. (1950) 6,060.

DECORATED STYLE, the second style of English Gothic architecture, in use from about 1250 to about 1350, when it was supplanted by the Perpendicular. It is distinguished from the Early English style, from which it developed, by lighter construction and more complex vaulting; by the more flowing or wavy lines of its tracery, especially of its windows; by the greater richness of the decorations of the capitals of its columns and of the moldings of its doorways, niches, and finials; and by a more profuse and naturalistic, though perhaps more florid, style of ornamentation. The Decorated style is divided into two periods: the geometric, lasting until about 1300, in which geometrical figures were introduced in ornamentation; and the curvilinear, characterized by a flowing ogee curve. See also ARCHITECTURE—Gothic; GOTHIC ARCHITECTURE—England.

DECORATION DAY. See MEMORIAL DAY.

DECORATIONS. See ORDERS AND DECORATIONS.

DECORATIVE ART. According to general usage, the term "decorative art" embraces all the arts of design and representation except the fine arts (q.v.). It includes specifically those arts sometimes referred to as useful, mechanical, or industrial. Some are applied to the decoration of buildings or other fixed structures. These, which are called the major decorative arts, include architectural sculpture and carving, mosaic, inlay, stained glass, and woodwork. Others are used to decorate movable objects in buildings and are known as the minor decorative arts, or more simply as the minor arts. Among these are furniture, textiles, pottery, glass, metalwork, and leatherwork. Civil and religious apparel and accessories and armor are also counted among the decorative arts.

Although a decorative art serves a useful purpose, such as ornamenting the interior or exterior of a building, and thus stands in contrast with a "pure" fine art, such as an easel painting, which theoretically exists for itself alone, there is often no sharp line of demarcation between the two types of art. A number of the supreme examples of the fine arts were made with express decorative intent. Among these are the Parthenon marbles of ancient Greek art, the Chartres sculptures of medieval France, and the Giotto frescoes of 14th century Italy, all of which are essentially the ornaments of architecture. It is evident, then, that some of the examples of decorative art are of such a character that by general consent they are classed among the fine arts. Their powerful intellectual or emotional content makes the epithet "decorative" seem unsuited for them. In this connection it may be noted that there were no fine or decorative arts, consciously made as such, in the ancient world, in the Orient, or in medieval Europe, where the same master might paint an altarpiece (which we now call fine art), or a battle flag (which we call decorative art). The distinction has been made only since the Renaissance in Europe, when artist and artisan were for the first time placed in separate categories. So when this modern concept is applied to ancient art, the resulting distinction may appear at times to be arbitrary and inconclusive.

The basis of decorative art is, of course, decoration, and the first essential of decoration is a defined and limited space, as, for example, the surface of a vase. Decoration is achieved by modifications of the form or surface of a given object, and there are two principal types, the plastic and the chromatic. Both of these give a two-dimensional effect in relation to the structure of the object decorated. The plastic techniques include all kinds of modeling and carving, embossing, forging, and casting. Among the chromatic techniques are painting, inlay, weaving, and the like.

Decorative art makes use of naturalistic representation not only in such highly architectural forms as mural painting and decorative sculpture, but in the so-called minor arts as well, as in the decoration of pottery. In general, however, the decorative arts tend to limit themselves to a conventional style of representation. Indeed, their very essence lies in conventionality, which means balance, repose, and order, qualities eminently desirable in objects of daily use.

In the vocabulary of formal decoration three words are often used: motif, pattern, and design. A motif is a single decorative element which, when fitted into a pattern, becomes part of the complete design.

The sources of decorative motifs are as varied as man's interests. Artists of all races and ages have used human figures and the forms of animals, sometimes even merging them into grotesque combinations. In the more primitive cultures human and animal figures were apt to possess symbolic meaning. The world of botany, with its myriad of floral and foliate forms, is another rich source of decorative motifs. Designers have also delighted to use objects of familiar human use, such as buildings and fountains. And they have also invented motifs of purely geometric form.

By means of pattern, which is the orderly disposition of motifs, decoration obtains that symmetry and rhythm which is essential to it. Pat-

tern is susceptible of endless change by such means as variation of mass and line, of light and shade, of color, and of rhythmic variations, alternations, and repetitions of motifs.

Design results as the effect of pattern on the object decorated. Design can also exist without the use of obvious decoration. Designers, especially those of the 20th century, have found that design can exist solely in the relation of the form of the object itself to its material. Material then assumes the role of pattern.

Decoration can range from the utter simplicity of much modern work to the lush overloading of ornament so favored in the baroque 17th century. Each culture has its own standards of decoration, and some, as, for example, the Oriental, are far removed in style from those of the West and not always easy for the Westerner fully to understand. Yet if a culture has reached a high state of development, the chances are that the decorative art produced by it will be an accurate reflection of it.

The ornamental styles current at any date reflect the perceptions, as interpreted by artists and craftsmen, of the ruling class of the moment, whether it be one of birth, taste, wealth, or learning. The great masses of humanity have generally taken their decorative forms as hand-me-downs, popular art being a naive version of what has just ceased to be the high style of the moment. This is clearly evident, for example, by comparing the sophisticated fashions of the French court at Versailles with the peasant art of France.

For additional information on the various major decorative arts, see also ARCHITECTURE; BRONZE AND BRASS IN ART; INTERIOR DECORATION; MOSAIC; MURAL PAINTING; PAINTING; SCULPTURE; STAINED GLASS.

MINOR DECORATIVE ARTS

The minor arts have been produced throughout the ages, and their diversity is so great that it is not feasible to consider them all in detail. Nor is it necessary to do so, for they vary greatly in the degree of their importance. The most significant expressions of the minor arts are surely those of the great cultural periods, and it is to these that we limit ourselves.

Much information is at hand concerning the minor arts of recent centuries, including the European productions which form so integral a part of the cultural background of the United States. We know progressively less of the minor arts of the earlier periods, as these are farther removed from us in time; the little we know of the very ancient periods is usually the result of the chance survival of a few works. Although the minor arts had their beginnings in primitive cultures, these earliest phases form such brief footnotes to the whole story that they can be passed over in a general review. We therefore look first to the minor arts of the most remote of the great cultures, Egypt.

Egypt.—The many objects found in the tombs of the royal and wealthy Egyptians tell of the state of the minor arts during the 3,000 years preceding the advent of Christ. Egyptian art is unique in that it is so highly traditional in expression that it shows but little change in style from one dynasty to another.

Furniture was not one of the more important Egyptian minor arts. It was little used. The most common pieces were the chair, stool, and bed. The chair, to cite one instance, was simply designed; the seat was often closer to the floor than in

modern models; the legs sometimes resembled the legs of animals. In the field of pottery, Egyptians created various types, including a glazed ware called faience, of a high order, for the table and for toilet articles. Glass served similar purposes, as did also gold, silver, bronze, and carved alabaster. Many vessels were decorated with naturalistic paintings or with hieroglyphic inscriptions. Some of these, such as jugs and plates, bear a striking resemblance in form to objects we use today. Egyptians were particularly fond of necklaces made up of many elements, including scarabs and other amulets. Gold, turquoise, and other precious materials were used, often with exquisite craftsmanship.

The Middle East.—Little is left to show the nature and extent of the minor arts in such ancient cultures as those of the Hebrews, Chaldeans, Assyrians, Babylonians, and Persians. The specimens that have come to light, however fragmentary, show a mastery in the handling of metal, such as gold, silver, bronze, and iron, and of pottery. Ancient Middle Eastern jewelry is sometimes gaudy and imaginative. Details appearing on stone reliefs from Assyria and Babylonia indicate the nature of the textile arts. In the latest of the pre-Islamic cultures of the Middle East, such as the Sassanian, silks were ornamented with bold, conventionalized animal patterns.

The religion of Mohammed, who died in 632 A.D., changed the course of Middle Eastern art. Mohammed's followers created an empire which in time extended from India to Spain. The arts of these regions, though the work of different cultural and racial groups, may be considered as a unity. They were largely the decorative arts, since the arts of painting and sculpture, especially in the decoration of mosques, suffered from religious ordinances which frowned on the use of human figures and animal forms.

The Moslems were past masters in the minor art of pottery making. They were especially successful in the manufacture of richly colored glazes. Among the chief Persian types are the wares made in Rhages in the 11th and 12th centuries, at Kashan in the 13th and 14th, and the Kubachi ware made in the 16th and 17th centuries. Rhages ware was often painted with naturalistic designs; that of Kashan, lustered. The 12th and 13th century wares from Rakka, with conventionalized decoration, typify Mesopotamian work. Turkish potteries of the 16th and 17th centuries feature vessels and tiles with brilliantly colored floral designs. In Spain the Hispano-Moresque pottery of the 14th and 15th centuries is exemplified by the large lustered plates, which sometimes bear Spanish arms. In the field of glassware, the Mesopotamian and Syrian enameled glass of the 13th and 14th centuries attained a high state of perfection. Large mosque lamps are the most notable pieces. Outstanding among the products of the metalworker are the large vessels of brass with elaborate silver inlay, the best of which were made about the 13th century. Mosul in Mesopotamia was a great center for this kind of work.

The earliest Mohammedan textiles are probably the Egypto-Arabic fabrics woven by the Copts, often in tapestry and with Arabic lettering serving as ornament. Silks were woven in Persia from early Islamic times, the most elaborate material being those of the 16th and 17th centuries, when richly figured and polychromed fabrics came from the looms of Yezd, Kashan, and Isfahan. Turkish velvets and brocades of the

same period, woven in Bursa (Brusa), show striking floral designs, more conventionally rendered than the Persian. Fine silks were also woven in Sicily and Spain, the Hispano-Moresque weaves of the 14th and 15th centuries having richly colored interlacing ornament. Turkish, Moroccan, Persian, and Indian embroideries reveal the various manifestations of Moslem needlework. Printed cottons of unequaled quality came from India in the 17th and 18th centuries. Many large printed hangings, called palampores, were exported to Europe.

The 16th century in Persia was the greatest period in the history of rug weaving. Floral designs are the basis of decoration for these magnificent knotted weaves. One type, because of its decoration, is called the medallion carpet; the animal and garden carpets are other types. The so-called Polonaise or Polish carpets are small silk rugs woven in Persia. Indian carpets show a freer and more naturalistic design than do the Persian. Turkish carpets from Asia Minor, on the other hand, are more stylized. Outstanding among these are Ghiordes prayer rugs, ornamented with a prayer niche to indicate the direction of Mecca. Hispano-Moresque carpets show the same geometric ornament found on the textiles. Rugs were also woven in tapestry weave in various centers of the Middle East. (See also RUGS, ORIENTAL.)

As a rule, Mohammedans did not use much decorated wood furniture. Some of the more interesting pieces of furniture were made for use in mosques and are exemplified by Koran stands. Particularly fine examples, decorated with characteristically Moslem foliate interlacing, were made during the 13th and 14th centuries.

See also MOHAMMEDAN ART; PERSIAN ART.

The Far East.—Although the minor arts of China have a long and brilliant history, with the exception of bronzes there is little left antedating the Christian era. Large cast bronze vessels, some of which are in the shapes of animals, go back to the Shang (1523–1027 B.C.) and Chou (1027–256 B.C.) dynasties. These massive objects are decorated with striking relief ornament—in the form of inscriptions, conventional animal grotesques, and other symbolic decorations. Some were evidently used in connection with religious rites, and may on occasion have served as sacrificial vessels. Bronze mirrors are typical of the work done in the T'ang (618–906 A.D.) and Sung (960–1279 A.D.) dynasties.

Pottery gives a particularly full account of the development of the minor art styles in China since about the beginning of the Christian era. Pottery of the Han dynasty (202 B.C.–220 A.D.), rugged and massive in form like bronzes, stands in sharp contrast with the more graceful productions of the later T'ang age. Figure modeling was practiced in addition to the manufacture of vessels, the T'ang pottery horses being notable examples. Sung wares show a highly developed sense of form and a fine feeling for color, the richly glazed Chün wares being typical of the work of this period. Porcelain was a discovery of the Chinese. Porcelain clay consists of a mixture of kaolin or China clay, and petuntse or China stone, a man-made clay produced by crushing a feldspathic rock. The making of porcelain required furnaces capable of producing a degree of heat many times that needed for ordinary pottery. The characteristics of porcelain—a smooth, creamy body, hardness, resistance to acids, and nonconductibility of

heat—made it desirable for many purposes. It is not known when it was first made, but by the Ming dynasty (1368–1644) it was being produced in great quantity. The chief porcelain center was, and still is, Chingtechen (now called Fowliang). Ming porcelains show the wide range of color which potters were able to use, and the later K'ang-hsi (1662–1722) and Ch'ien-lung (1736–1796) productions reveal how potters carried design and color to the ultimate limits. From these latter periods come the famous *famille verte*, *famille noire*, *sang de boeuf*, and other wares. Excellent pottery was also made in Korea and Japan. (See also CHINA—*Ceramics*; JAPANESE CERAMICS.)

Both the Chinese and the Japanese were masters in the arts of carving jades, crystals, and other fine substances into small objects, such as snuff bottles, and ornaments. The Chinese also were skilled in the making of cloisonné enamel, and in the art of lacquering. The large Coromandel screens with painted decoration are notable examples of lacquer work.

China is the home of silk and silk weaving. The silkworm was first cultivated there, and it was the Chinese who developed and in many instances brought to perfection the weaving techniques which permitted them to make the fullest use of the silken threads on their looms. These techniques would later be appropriated by the weavers of the Middle East and Europe. Although fragmentary silks exist from the beginning of the Christian era, the silks of the Ming dynasty are the first we have of any abundance. Their vigorous naturalistic designs stand in contrast with the less inspired productions of the succeeding Manchu or Ch'ing dynasty (1644–1912). Embroideries and tapestries, on the other hand, stand as high points among all textile arts. These two techniques were often used for the decoration of court robes, whose ornament was in part composed of innumerable motifs replete with symbolic meaning. Japanese silks and embroideries of this period show a superb sense of textile design; in them the Japanese penchant for floral decoration is fully evident.

Greece and Rome.—The celebrated classical style of Greece and Rome is mostly fully exemplified in architecture and architectural decoration. It is characterized by a fine sense of proportion and by the repeated use of a few motifs, such as the acanthus leaf (see ACANTHUS IN ART). This style, which was so profoundly to affect European post-Gothic art, is most clearly seen, among the minor arts, in pottery, which the Greeks brought to a high state of perfection. According to the traditional view, the great period of Greek pottery lies between the 6th and 4th centuries B.C., when production centered in Athens. Pottery was then standardized into a few shapes, such as large vases (the amphora, hydria, and crater). Red and black were the usual colors. Skilled painters, who at times even signed their works, supplied decorations in the form of scenes from the lives of the gods and heroes and subjects drawn from daily life. During the subsequent Hellenistic age, relief work gradually supplanted painting as the chief decorative element of pottery. The most distinguished Roman pottery is the type which was cast from molds and called Arretine ware, from Arezzo, the home of the industry. Roman artisans excelled in another art, that of making glass vessels. Due to a decomposition that has developed through the passage of years, the delicate texture

of nearly all extant Roman glass has acquired an iridescence which, though fortuitous, is now its most highly esteemed quality.

In the field of metalwork, the Greeks excelled as goldsmiths, their gold necklaces and other ornaments being wrought with an exquisite precision. Silver was used for plate, and bronze was cast into mirrors and other articles of daily use, such as jars and lamps. Many examples uncovered at Pompeii show the Roman version of this Greek minor art. Both Greeks and Romans wore finely carved gems. Because of the lack of existing objects, the fields of furniture and textiles do not now rank as among the more important ones. It is enough to note that the typical pieces of furniture were the couch, table, and chair; and that textiles are best represented by the tapestries woven by the Copts in Egypt at the very end of the classical age.

Medieval Europe.—Medieval Europe includes the centuries between the dissolution of the Roman Empire and the rise of the Renaissance. Its chief periods were the early Christian, which centered in Rome; the Byzantine, of which the center was Constantinople; and the Romanesque and Gothic, which centered in France. By and large, medieval art was nonsecular: it was indissolubly linked with the Christian Church. Christian symbolism prevailed. The minor arts flourished.

The pre-eminent minor arts were those of enameling, goldsmith's work, work in ivory (see *IVORIES*), and textiles. In Byzantine times cloisonné enamels (translucent enamels on gold) decorated religious articles, such as reliquaries and book covers, imparting to them a jewel-like richness. In Romanesque and Gothic times champlevé enamels (opaque enamels on bronze) were used. Particularly fine examples of the latter came from the region of the Meuse and the French city of Limoges. Ivory was a favorite material throughout the Middle Ages, craftsmen carving many small shrines and caskets—to mention only two varieties of work—in this costly material. In the field of weaving, remarkable silks were woven in Constantinople during the Byzantine age and in the Italian town of Lucca during the Gothic age. Tapestry centers have existed in France and Flanders since the 14th century: in Paris, Arras, Tournai, and later in Brussels. Although many of the hangings made were of a religious nature, many were also woven for purely secular use; tapestries, in fact, represent the finest expression of medieval secular art. Embroidery was frequently used in medieval times, especially in the decoration of church vestments, such as copes and chasubles, and one of the most notable schools was the English. *Opus Anglicum* or *Anglicanum*, as English embroidery was then called, was in demand throughout Europe during the 14th century.

Some of the most notable examples of furniture, such as the Gothic choir stalls, were part of the church woodwork and do not properly count as a minor art. What there is of secular furniture dates from the end of the Middle Ages, and is exemplified by the chests and sideboards of northern France and Flanders. Pottery, a characteristically secular art, came into its own at the end of the period, and is best exemplified by the boldly designed majolica of Spain and Italy. See also *MAJOLICA* AND *MEZZA-MAJOLICA*.

Renaissance and Post-Renaissance Europe.—The salient feature of the Renaissance style

lies in the use of forms and motifs inspired by the arts of ancient Greece and Rome. Not only were medieval styles gradually abandoned, however, but emphasis was shifted from the ecclesiastical to the secular. During the Renaissance and post-Renaissance periods two nations led in the production of the minor arts: first Italy and then France. Since the arts of the rest of Europe depended to a large extent on those of the two leaders, it is needless to dwell in detail on them. From the American point of view, however, the minor arts of England hold a particular appeal, since these English arts are the basis from which much of those of the United States developed.

Italy.—The Italian Renaissance style is perhaps most completely expressed in architecture, its earliest development being shown in the work of the Florentine architect Filippo Brunelleschi (1377–1446). In the minor arts, the woodcarver quickly reflected the work of the architect, creating furniture for church and secular use in the new style. He worked either in relief or in a mosaiclike inlay called *intarsia*. Arabesque designs of ancient Roman origin were a favorite decoration. Characteristic of the secular furniture were refectory tables with massively carved legs, cabinets, and folding chairs. The most meticulous workmanship was often lavished on the chest, called the *cassone*, which was sometimes used as a bridal gift. Leading artists painted *cassone* panels. In the 16th century furniture assumed the massive, architectural forms of the period. Typical of the furniture of the baroque 17th century were the ponderous Roman armchairs, elaborately carved and upholstered. By the 18th century, Italy was losing her dominant position to France as leader in the minor arts, and the delightful Venetian painted furniture of the age was but a variant of the French style.

Italian pottery (*majolica*) of the Renaissance forms one of the more brilliant phases of the minor arts. The centers in Florence, Urbino, Faenza, and Gubbio produced wares at once bold and brilliant, with designs usually of a pictorial character. They were both useful and ornamental and included, in addition to objects of table use, handsome jars for the apothecary. Ever since the Middle Ages, Venetian masters have produced glass of the greatest delicacy. Venetian glass often has painted or engraved decoration.

Italian goldsmiths of the Renaissance, working in gold, silver, enamel, precious stones, and substances such as rock crystal, created many spectacular jewels, decorative table pieces, and articles of religious use (chalices and crucifixes). Benvenuto Cellini (1500–1571) was the most renowned goldsmith of the age. Bronze medals, such as those by Antonio Pisano (il Pisanello, c.1395–c.1455), and figurines, such as those by Andrea Riccio (Andrea Briosco, 1470?–1532), were popular as cabinet pieces throughout the Renaissance. A great number of ornamental bronze inkwells, lamps, and incense burners were also produced.

Developing the tradition begun in Lucca, Florentines of the 15th century wove superbly designed velvets and brocades. Only the Venetians could rival them in the splendor of their work. And during the 16th and 17th centuries the looms of Genoa produced fabrics of such sumptuousness that the term "*Genoese*" is still associated with rich, multicolored velvets. In the 18th century, Venetians created brocades with fantastic, Oriental-inspired designs. Venetian

lacemakers of the late Renaissance perfected the technique of needlepoint, creating showy masterpieces in *gros point* and rose point. Fine embroideries were also made, especially for vestments, on the decoration of which the embroideries of the baroque age often rivaled painters in the naturalism of their representation.

Ornament designs, illustrated books, and other printed illustrations exercised a vast influence both in spreading and standardizing the decorative art styles. Engraved designs by such a Renaissance master of ornament as Agostino Veneziano (1490?-1540) might be used for the decoration of pottery and woodwork not only in Italy, but elsewhere in Europe.

France.—When Renaissance style conquered the French court at the beginning of the 16th century, French artists quickly revamped Italian styles to suit their own national temperament. The great age for the minor arts in France began, however, with the reign of Louis XIV (1643-1715), when, with Jean Baptiste Colbert as minister of finance, a sustained effort was made to foster all the arts. The quality and extent of French production during the remainder of the *ancien régime* indicates the degree of success of this farsighted policy.

Perhaps the most typical piece of furniture of the 16th century was the cabinet (*armoire*), often elaborately carved and painted. Some of the more elaborate cabinets are associated with the name of Hugues Sambin (fl. 1550-1600). Draw-top tables, often intricately carved, sometimes recall the style of Jacques Androuet Du Cerceau (1515?-1584). A gradual development away from Italianate styles culminated in the thoroughly national Louis XIV style of the 17th century. As exemplified by furniture, this manner was grandiose, formal, and highly ornamented. Large *armoires*, desks, tables, and upholstered armchairs were familiar objects of the age. They were sometimes made in *buhlwork* (see *BUHL* or *BUHLWORK*), a curious technique of tortoise shell and brass inlay, named after a corruption of the surname of the cabinet-maker Charles André Boulle (1642-1732). With the coming of the 18th century the formidable Louis XIV style gave way to the light, tenuous, and asymmetric forms of rococo art of the Louis XV (1715-1774) and Louis XVI (1774-1792) periods. One type of decoration found on furniture indicates that it was also the age of *chinoiserie*. Furniture was sometimes made in *marquetry*, and often embellished with gilt bronze (*ormolu*) mounts. The chair, perhaps the most typical piece of the period, was likely to be upholstered in silk, tapestry, or embroidery. During the second half of the century a new formality was evident, inspired in part by a renewed interest in the antique. The revival of the antique, culminating in the Empire style, was well expressed in the form and decoration of furniture. Beds, chairs, and tables were almost Roman. Furniture of the later 19th century was largely revivalistic, being based on all the earlier European styles.

In the field of pottery, the 16th century was notable for the production of *faïence*, named for the Italian pottery center of Faenza. Bernard Palissy (c.1510-1589), eminent scientist and writer, produced after his own design, and with glazes of his own invention, a number of pieces in the so-called rustic style, with plants and animals worked in high relief. In the 17th century the city of Rouen attained an eminence in pottery which it continued to hold throughout the 18th.

French porcelain is inseparably associated with Sèvres, where Louis XV established a royal factory in 1756. Sèvres tableware and decorative pieces count among the most elaborate productions of the period.

Little of the work of the French silversmith exists antedating 1650. During the later 17th century and in the 18th a vast amount of silver was made, much of which was extraordinarily fine. It was manufactured throughout France, in Bordeaux, Strasbourg, Lille, Rennes, and many other cities. The best pieces, usually for the table, were likely to be made in Paris by masters, such as Thomas Germain (1673-1748), who often worked on royal order. In the 16th century the plain surface was much in evidence, in the 17th the elaborate baroque decorations began to cover the surface, and during the 18th the plain silver surface almost disappeared under a wealth of ornament. French goldsmiths came to the fore in the 18th century with the production of various *de luxe* feminine accessories: vanity caselike boxes, *etuis*, *cartes de bal*, *nécessaires*. Every precious material available to the goldsmith was lavished on these exquisite trifles.

In the 16th century the French excelled in the art of painting in enamel on copper. Decorative vessels and plaques to be inset in furniture were often made of these richly hued enamels. Among the many masters working in Limoges, the center of the industry, various members of the Pénicaud and Limosin families were outstanding. The French were also the chief exponents of the art of bookbinding. Fine stamped and tooled leather bindings, some in the Moresque style, were made in Lyon and Paris in the 16th century. Typical of the bindings of the next two centuries, which often bore the arms or ciphers of the owners, were the creations of the Dubuisson.

French silk weaves attained a fame during the reign of Louis XIV that increased during the 18th century. A profusion of fabrics of unusual beauty poured forth from Lyon, the French silk center. Specially trained designers, such as Jean Revel (1684-1751), Philippe de La Salle (1723-1804), and Jean Baptiste Huet (1745-1811), served this industry, which supplied materials for both dress and upholstery. French designs, nearly all of them of floral inspiration, were imitated throughout Europe. In the field of lacemaking, too, the French won an enviable position. The 17th and 18th century needlepoint of Alençon and Argentan and the bobbin lace of Valenciennes are representative of a material widely used on the clothing of both men and women. Embroidery was frequently used for the upholstery of beds and chairs, for table covers, and for vestments. The French were also skilled in the manufacture of printed cottons during the 18th and 19th centuries, the finest prints coming from the factory at Jouyen-Josas established by Christophe Philippe Oberkampf (1738-1814). And the related wallpapers, such as those created by Réveillon in the 18th century, set a standard that has never been surpassed.

Paris was the center of the *de luxe* tapestry industry, royal looms having been in operation there since the 16th century. In 1667, Colbert acquired the Gobelin manufactory (see *GOBELINS*), which for nearly a century and a half produced countless sets of the greatest opulence. Manufactories also existed in other localities, as in Fontainebleau in the 16th century, and in Beauvais and Aubusson in the 18th. François Boucher

(1703–1770) and other eminent painters supplied designs for weavers, who were often Flemish. At the royal manufactory of the Savonnerie, rugs knotted in the Persian manner were woven for the decoration of palace and château. The large carpets of the Louis XIV period represent the best of this type of weaving.

England.—England accepted the Renaissance styles slowly; until the Elizabethan period the minor arts remained almost Gothic, and until the period of Charles II they were often provincial in character.

Furniture perhaps offers the fullest single record of the development of the English minor arts. During the 16th century, Elizabethan masters continued to use the forms of Gothic furniture, adding Renaissance motifs which they did not quite understand. Chairs and stools, often composed of turned members, cupboards, chests, and tables are the pieces most familiar to us. It was not until the second half of the 17th century that cabinetmakers, following the example of such architects as Inigo Jones (1573–1652) and Sir Christopher Wren (1632–1723), finally gave up their local styles. The influence of French and other Continental sources appeared in the typical furniture of the age, seaweed marquetry, for example, being an English equivalent of buhlwork. During the 18th century, the stately furniture of the Queen Anne and early Georgian periods was followed by a brilliant age, highlighted by the work of Thomas Chippendale (1718?–1779), creator of Chinese Chippendale and other popular styles. (See also CHIPPENDALE FURNITURE.) During the second half of the century the brothers Adam created interiors and furniture in the current neoclassical taste. The many graceful pieces in the Hepplewhite and Sheraton styles were modifications of Adam neoclassicism. The Regency furniture of the early 19th century was reminiscent of the French Empire style; the heavily composed mid-Victorian furniture was a fanciful evocation of various styles of the past. The Arts and Crafts movement of the later 19th century, and particularly the work of William Morris (1834–1896), focused attention on simply designed furniture of sound construction.

English potters produced wares which, if less luxurious than the Continental, maintained as high standards of excellence. A typical example of the 17th century, the slip ware bearing the name of Thomas Toft, was an effectively designed example of popular art. The most famous of the English potters, Josiah Wedgwood (1730–1795), produced a wide range of work, including many pieces inspired by the antique. He even had the famous antique *Portland Vase* copied at his Etruria works. During the middle of the 18th century a number of industries were founded for the manufacture of porcelain: at Chelsea, Derby, Bristol, Bow, Worcester, Lowestoft, Staffordshire, and other centers, each of which produced its own characteristic wares. Many were made for the tea service, and decorative figures, such as shepherdesses, were highly popular. (See also CHELSEA PORCELAINS; DERBY PORCELAINS; LOWESTOFT PORCELAIN; WEDGWOOD WARE.)

Englishmen of the 16th century had a traditional regard for the work of the goldsmith, often using elaborate cups and saltcellars as gifts. The few examples that remain show that many Renaissance forms came to England largely through the work of Augsburg and Nürnberg

designers. The modern era of English silver began with the reign of Charles II (1660–1685). Many tankards, tea, coffee, and chocolate pots, candlesticks, and other objects for the table and for toilet use were made from then on. The more substantially designed silver of the early 18th century showed a certain Dutch influence; the gayer creations of the succeeding decades indicated the impress of the dominant French styles. Among the latter, the rococo creations of the Huguenot Paul de Lamerie (1688–1751) and the neoclassical pieces of Paul Storr (1771–1844) were outstanding.

The English center of silk weaving in the 18th century was Spitalfields in London, where a number of Huguenots had settled to continue the trade they had once practiced in France. More typically English are the engaging printed cottons, made since the mid-18th century. The most English of the English textile arts is embroidery. From Elizabethan times on needlework pictures (mainly Old Testament scenes) and many objects of daily use, such as bed hangings and table and cushion covers, were made in large numbers. Embroidery was practiced not so much by a trade as by the lady of the house in her hours of leisure, and one of its characteristic expressions was the sampler, in which the embroiderer displayed her repertory of stitches and designs. Small tapestry panels were made during the late Elizabethan period on the Sheldon looms in the Midlands, the cushion cover being a typical piece. The Mortlake looms were established in the 17th century for the manufacture of large hangings; the Soho looms were the largest works operating in the 18th century. On the whole, the English tapestries were inferior to those of the Continent.

Germany, the Lowlands, and Spain.—To a considerable extent the minor arts of these countries were reflections of those developed in Italy or France. In some cases, however, their minor arts achieved a notable independence and originality. Among these may be mentioned the work of the German silversmiths who during the Renaissance succeeded in producing works of an elaboration to defy any talent but the most skilled. Decorative figures of animals and humans, elaborate ewers and basins, and covered cups were among the pieces produced in centers such as Augsburg and Nürnberg. Cups were often composed of exotic materials, such as mother-of-pearl, coconuts, and ostrich eggs, set on grotesque silver-gilt mounts. Distinguished masters—the Jamnitzer family, for example—created designs which influenced the contemporary silversmiths of other countries.

Germans were also in the forefront in the manufacture of porcelain. Until the 18th century all porcelain used in Europe had to be imported, with no little effort, from China, for only the Chinese knew the secret of its manufacture. Then, with the support of Frederick Augustus I (Augustus the Strong), elector of Saxony (r. 1694–1733), who was Europe's most avid collector of Chinese porcelains, a chemist named Johann Friedrich Böttger (1682–1719) conducted experiments which led, about 1710, to the discovery of how the material was made. The elector established the famous Meissen porcelain works near Dresden, with Böttger in charge. This center served as the model for all other German factories, such as those at Nymphenburg, Frankenthal, and Höchst (now part of Frankfurt am

Main), as well as for those established in Austria, France, England, and elsewhere in Europe.

Brussels tapestry weavers created their most spectacular productions during the 16th century. Masters such as Pieter van Aelst (d. 1536) and the Pannemaker family, working largely for the Habsburgs, who then ruled their land, produced sets of obvious magnificence. The subjects were generally taken from Greek or Roman history or from the Old Testament, and the more elaborate pieces were embellished with gold and silver threads. Tapestries with genre scenes after David Teniers the Younger (1610-1690) were the typical Brussels productions of the 18th century. Lacemaking also flourished in Brussels and other Flemish centers, *point d'Angleterre*, made in Brussels, being one of the most charming types of 18th century bobbin lace.

The most characteristic minor art of Holland is delftware (q.v.), a pearly white pottery with decoration generally in blue, made in Delft during the 17th and 18th centuries. Like Dutch tiles, it was in great demand in England.

Spain possessed highly talented silversmiths, such as the Renaissance master Juan de Arcey Villafañe (1535-1603), whose monumental works were mostly of a religious nature. And the Moorish traditions of rug weaving and pottery making were continued in Spain throughout the Renaissance with distinguished results. At the same time, leatherwork also flourished, tooled and painted leather being frequently used to cover the entire walls of rooms.

The United States and Latin America.—

The minor arts of the American colonies on the Atlantic seaboard reflected those of the mother country, England. Once independence was achieved, English influence lessened. The arts of the 19th century, though always evincing decided national traits, were based largely on European models. And the minor arts of the 20th century still show a Continental inspiration, although United States industry and design has made substantial contributions.

Colonial furniture followed English styles faithfully, though often in a simplified version. Thus one frequently comes upon pieces classed as colonial Chippendale and colonial Sheraton. Among the early 19th century masters who followed the contemporary neoclassical style, the Scottish-born New Yorker Duncan Phyfe (1768-1854) was outstanding. (See also FURNITURE, AMERICAN.)

American silversmiths, especially of the colonial period, produced pieces distinguished for their graceful lines and for their respect of the silver material. Paul Revere (1735-1818), the American patriot, was an eminent Boston silversmith. Most colonial pottery was imported: from England (Derby, Worcester), from Holland (delftware), and from China (the so-called Lowestoft ware).

Much colonial glass of a simple and graceful type was made for table use in southern New Jersey. Such a master as Henry William Stiegel (1729-1785) produced examples remembered for the quality of their fabric and for the clarity of their colors. The 19th century molded Sandwich glass was a characteristic American product. At the end of the century, Louis Comfort Tiffany (1848-1933), himself influenced by the Arts and Crafts movement, developed his remarkable Favrite glass, distinguished for its unexpected forms and colors.

The minor arts of the many Spanish colonies in North and South America reflected the styles of the mother country, with this difference: as many of the artisans were Indians, a strong native flavor was always present. The textiles, pottery, and metalwork of both Mexico and Peru are outstanding, in part because even before the conquest the native Indians were already masters of these arts.

Modern Period.—As we have indicated (see section on *Renaissance and Post-Renaissance Europe—England*), William Morris reacted strongly to the 19th century mania for those period pieces which, possessing no originality of their own, seemed merely uninspired reflections of the achievements of earlier eras. He was the first to turn men's attention toward objects designed simply and functionally.

The *art nouveau* movement of the late 19th and early 20th centuries represented another milestone in the progress of the decorative arts. The Belgian Henry van de Velde (1863-) designed furniture with forms based on those to be observed in living plants. A leader in the *art nouveau* movement, he carried the style first to Paris and then to Germany, where it flourished under the name *Jugendstil*.

Pre-World War I Germany and Austria were centers for much effective experimentation toward an acceptable modern decorative idiom. In Austria, Josef Hoffmann (1870-) organized the Wiener Werkstätte, composed of a group of young artists who continued to be productive after the war. The essence of the Werkstätte style was a gay and delicate approach to the problems at hand. In Germany the more mechanistic Bauhaus was founded in 1919 under the leadership of Walter Gropius (1883-). The Bauhaus group considered their design problems to be industrial ones and sought to link art and engineering. Marcel Breuer (1902-), one of the group, made use of a newly invented seamless tube to create the steel tube chair.

In the 1920's, French designers came into their own. Their eminence was signaled by the famous Paris Exposition of Decorative Arts held in 1925. The French style combined the simplicities of the modern idiom with that tradition of elegance which is so much a part of French craftsmanship. Their point of view was well exemplified in the furniture created by Émile Jacques Ruhlmann (1869-1933).

Modern decorative art came gradually to the United States. In his Favrite glass (see section on *The United States and Latin America*), Louis Tiffany independently seemed to approach the rhythms of the *art nouveau* style. Another advance was the creation in the early 20th century of the mission style—a style recalled by bulky and often handsome pieces of furniture still found in many homes. The social and economic revolution that followed the crash of 1929 paved the way for a general acceptance of what we call modern.

By the mid-20th century the modern style was at home in the United States as well as in western Europe. In furniture, ceramics, glass, textiles, and other media the story was the same. In glass, for example, equally effective pieces were produced by Lalique (France), Orrefors (Sweden), and Steuben (Corning Glass Works, United States). In the United States many noted men and women came to the fore: Tommi Parzinger (1903-) and Charles Eames

(1907–), in furniture design; Russel Wright (1904–) and Waylande Gregory (1905–), in ceramics; and Ruth Reeves (1892–) and Dorothy Wright Liebes (1899–), in textiles. American industrial designers won a significant place in contemporary life, for they turned their attention to all things concerned with living, not neglecting the kitchen. Raymond Loewy (1893–), to mention one of many, could produce a kitchen stove or a streamlined locomotive. With the development of new outlooks, techniques, and materials, there were no limits facing the designers and their clients, the masses of the American people. See also FURNITURE, MODERN.

For additional information on the various minor decorative arts, see also ART ENAMELS; BRONZE AND BRASS IN ART; CERAMICS; EMBROIDERY; FURNITURE; GLASS; GOLDSMITHING; INTERIOR DECORATION; JEWELRY; LACE; LACQUER AND LACQUERWORK; PORCELAIN; POTTERY; SILVERWARE; TAPESTRIES.

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JOHN GOLDSMITH PHILLIPS,
Curator of Renaissance Art, Metropolitan Museum of Art.

DE CORT, Frans. See CORT, FRANS DE.

DE COSMOS, dē kōz'mōs, Amor (originally WILLIAM ALEXANDER SMITH), Canadian journalist and politician: b. Windsor, Nova Scotia, Canada, 1825; d. Victoria, British Columbia, July 4, 1897. He went in 1852 to California, where he had his name changed by law to Amor de Cosmos. Six years later he accompanied gold prospectors to British Columbia, where he established the *British Colonist*, in which he attacked the policies of Governor (later Sir) James Douglas. He became known as a reform leader, campaigned against a state church, and urged the union of the two colonies of Vancouver Island and British Columbia and the incorporation of the united colony in the Dominion of Canada. In 1871 he was elected as a Liberal to the Canadian House of Commons and to the Legislative Assembly of British Columbia; from 1872 to 1874 he was prime minister of British Columbia. He retired from the provincial assembly in 1874, but remained in the House of Commons until 1882.

DECOY, dē-koi' (de + coy, from Du. *kool*, cage), a pool or pond into which wildfowl are enticed. Curved channels, covered with net, lead to the pond from various directions. The birds enter the wide mouth of a channel and are netted or shot at its narrow end. The term is also applied to wooden ducks used to entice wildfowl to come within range of guns; and, by extension, to persons used to trap others into committing

an offense, or into a position where they may be robbed or swindled.

DECREE, in law, is the final or interim determination by a court of the rights of the parties to an action. In modern usage, the term is practically the equivalent of judgment, though formerly it was limited to determinations in actions in equity, and judgment was confined to actions at law. This distinction still prevails in jurisdictions where equitable and legal actions are differentiated. The word "decree" is also used in specialized senses in the law relating to divorce, admiralty, bankruptcy, and condemnation proceedings.

A decree is an order settling some substantial right or liability involved in a controversy which has been brought before a court; thus the term does not include interim orders on procedural matters arising in the course of a suit. An opinion which consists of the judge's reasons for rendering a decree is not an essential part of a decree. A decree is final if it disposes of the entire merits of the case, leaving no issues for future decision of the court. An interlocutory decree, on the other hand, is an intermediate determination, in which the court reserves some questions in the case for later adjudication. A decree nisi is one which takes effect at a specified future time.

RICHARD L. HIRSHBERG.

DECRESCENDO. See MUSICAL ELEMENTS AND TERMS.

DECRETALS, dē-krē'tālz. The name "decretal" is derived from the Late Latin *decretalis* [*epistola*], a papal letter embodying a decretum or decision, which was sent in reply to a question raised regarding a matter of discipline. Very often the recipient of such a letter was ordered to bring it to the attention of the ecclesiastical authorities in his region, so that the decision in question might be made a more general binding rule of conduct or action. In the strict sense, however, decretals should not be identified with the canons of councils, with papal dogmatic letters (*epistolae dogmaticae*), or with papal constitutions (*constitutiones*) issued by the pope on his own initiative (*motu proprio*). The earliest known decretal is probably that of Pope St. Siricius (r. 384–399), which was addressed in 385 to Himerius, bishop of Tarragona in Spain. In the drafting of such letters, the papal chancery was clearly influenced by the chancery form and style of the late Roman Empire. In a broader sense, the term "decretals" is employed to designate certain collections made after the *Decretum* of Gratian, which contain some nonpapal as well as papal decretals. These collections are important because, in part at least, they were subsequently incorporated into the *Corpus Juris Canonici* (q.v.).

In the period between the *Decretum* of Gratian (c.1150) and the *Decretals* of Gregory IX (r. 1227–1241), supplementary and new papal legislation was incorporated into five main collections, the *Quinque Compilationes Antiquae Decretalium*. These were recognized as official texts at the University of Bologna and, like the *Decretum* of Gratian, they were furnished with glosses or interpretations. The first of these collections, the *Breviarium extravagantium* (*extra Decretum vagantes*), was compiled by Bernard of Pavia

(d. 1213) in 1187–1191, and contains decretals not found in Gratian. Bernard divided his work into five books, which deal respectively with jurisdiction (*judex*), civil legal procedures (*judicium*), diocesan and regular clergy (*clerus*), marriage (*connubium*), and criminal procedure (*crimen*). This division of subject matter was followed in subsequent collections.

The *Decretals* of Gregory IX, the compilation of which was begun at his order in 1230 by the Dominican St. Raymond of Peñafort (1175?–1275) and was completed in 1234, mark an epoch in the history of canon law, for they were intended to constitute a new official code replacing earlier collections. Raymond retained the order of subject matter, the division into five books, and the titular and chapter divisions of each book as found in the earlier compilations. Even the rubrics or title headings were kept, apart from modifications in detail. Of the 1,971 chapters in the new collection, all but 200 come from the *Quinque Compilationes Antiquae Decretalium*. Raymond, however, by no means performed his task in an uncritical or mechanical fashion. He omitted 383 decisions—subsequently called *partes decisae*—from the older collections, and he made necessary modifications or furnished explanations, whenever this was deemed necessary, in the case of many decisions which were retained.

False or Pseudo-Isidorian Decretals.—The controversy over the origin, intent, and influence of these documents has perhaps made the term “decretals” most familiar to readers. Historical scholarship since the mid-19th century, and particularly since 1900, has finally solved the basic problems connected with this collection, and the sharp partisan controversy which they occasioned in the past has yielded to calm and objective critical evaluation. The false decretals were in part fabricated and in part compiled from genuine sources, very probably in the vicinity of Rheims, between 845 (or 847) and 857 (or 852). The expressed intention of the anonymous author, who calls himself Isidorus Mercator and who was thus confused with St. Isidore of Seville (560?–636), was to collect the widely scattered ecclesiastical canons and arrange them in one volume in the interests of ecclesiastical authority and of the welfare of the Christian population. The position of the Frankish church was precarious at this time, and the author's intention was laudable in itself, but the same can hardly be said of all the means employed to carry it out.

Besides a block of old and genuine material taken directly or indirectly from the 7th century *Collectio Hispana*, the pseudo-Isidorian decretals contain numerous forgeries: the *Donatio Constantini* (*Donation of Constantine*), 60 alleged decretals or papal letters, ranging from St. Clement I (r. c.88–c.97) to St. Miltiades (Melchiodes, r. 311–314), and 45 false decretals, ranging from St. Sylvester I (r. 314–335) to St. Gregory II (r. 715–731). It should be noted that several spurious documents antedate the forger and were actually used by him in good faith. The chief purpose of the forger was to protect and strengthen the bishops against the encroachments of king and nobility and against the increasing influence of metropolitan and provincial synods. The pope, and not the Frankish kings as heretofore, was to have the exclusive right of calling synods and ratifying their decisions, accused bishops were to have the right of papal appeal, all matters of major import affecting

bishops were to be referred to Rome for final decision, and laws of the land in conflict with canon law were to be void.

The pseudo-Isidorian decretals spread rapidly and almost without challenge, for they corresponded admirably to the spirit and needs of the age. In the period of the Cluniac and Gregorian reforms, they enjoyed an enhanced prestige. They definitely contributed to the strengthening of the moral and juridical primacy of the pope, although the papacy itself had no part in the original production of the pseudo-Isidorian collection of decretals.

Hincmar, archbishop of Reims (806?–882), was probably aware that the collection was fabricated to some extent, and some passages were questioned or rejected by the Synod of Gerstungen (1085) and by Marsilius of Padua (1290?–?1343) in his *Defensor pacis* (book 2:28,4), but it was almost universally recognized as genuine and as a work of St. Isidore of Seville until the close of the Middle Ages. The genuineness of the collection was seriously questioned by Nicholas of Cusa (1401–1464), later by the authors of the *Magdeburg Centuries* (1559–1574; see CENTURIES OF MAGDEBURG), and definitely by the Calvinist David Blondel (1591–1655), in 1628. The publication of the critical edition of the text, *Decretales Pseudo-Isidorianae* (Leipzig 1863), by Paul Hinschius (1835–1898), marked an epoch, but in recent decades this edition has been shown to be very defective.

See also CANON LAW—*History of Roman Catholic Law*.

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MARTIN R. P. MCGUIRE,
Professor of Greek, Latin, and Ancient History,
The Catholic University of America.

DECURION, dē-kū'ri-ōn (Lat. *decurio*), a colonial or municipal councilor in the administrative system of the Roman Empire. Chosen from the ranks of ex-magistrates or by appointment, the decurions were supposed to be at least 25 years of age and to possess a certain annual income; they held office for life. They were responsible for local administration and finance, but eventually their financial duties degenerated into the mere collection of taxes. Since they were liable for any defaults, the office became a burden rather than an honor.

DEDEKIND, dā'dē-kīnt (**Julius Wilhelm**), Richard, German mathematician: b. Brunswick, Germany, Oct. 6, 1831; d. there, Feb. 12, 1916. He received his Ph.D. degree in 1852 from the University of Göttingen, where he lectured on mathematics from 1854 to 1858. From then until 1862 he taught at the Swiss Federal Institute of Technology in Zurich, and from 1862 until 1912 at the Brunswick Technical High School. Dedekind is known for his work on algebraic numbers, which he expounded in *Über die Theorie der ganzen algebraischen Zahlen* (1879); his theory of irrational numbers, to which he contributed what he called cuts, in *Stetigkeit und irrationale*

Zahlen (1872); and a theory of ideals, in *Was sind und was sollen die Zahlen?* (1888).

DEDHAM, dĕd'ăm, town, Massachusetts, seat of Norfolk County, situated at an altitude of 120 feet, on the Charles River and on the New York, New Haven and Hartford Railroad, 9 miles southwest of Boston, of which it is a residential suburb. It has establishments manufacturing envelopes, paper cups, and porcelain. The Fairbanks House (1636, in part) is said to be the oldest frame house in the United States. The Dedham Historical Society maintains a valuable collection of early Americana.

Dedham is one of the oldest towns in Massachusetts, the first settlement having been made in 1635. It was incorporated in 1636, and in 1649 built what is believed to be the first free public school in America supported by a general tax. In 1921 the Norfolk County Courthouse was the scene of the trial of Nicola Sacco and Bartolomeo Vanzetti (see SACCO-VANZETTI CASE, THE). Pop. (1950) 18,487.

DEDICATION, Feast of. See HANUKKAH.

DEDUCTION, as a form of reasoning, is the process of deriving the logical consequences of propositions. Every deduction takes its point of departure from a set of premises and terminates in a conclusion. For a deduction to be valid, there must be certain objective relations between premises and conclusion, commonly designated as relations of logical implication. In deducing a conclusion B from a set of premises A, what is established is the impossibility of the joint truth of A and falsity of B. Nevertheless, the actual truth or falsity of the premises does not determine what can be validly deduced from them. False propositions as well as true ones have logical consequences, and these can be discovered without first ascertaining the truth or falsity of the propositions from which they are derivable. Moreover, it is often impossible to evaluate the truth or falsity of an assumption except by first deducing some of its consequences and by comparing them, among other things, with the results of observation. One of the primary functions of deductive inference in inquiry is to permit just such an evaluation of a given assumption or set of assumptions.

Many inferences sometimes loosely called deductive are not such actually. When Sir Isaac Newton professed to deduce his law of gravitation from the phenomena, he was not correctly describing his procedure. Although investigations such as his involve much deductive inference, his proposed law was simply a hypothesis, not itself obtained deductively, but the deductive consequences of which were in good agreement with his observational data. That the process of arriving at a law of nature is not wholly deductive is made evident by the circumstance that, while the premises may be true to the facts of observation, the conclusion allegedly deduced from them is often found to be false. It is frequently also said that the premises of a deduction are more general (in the sense of being more inclusive or comprehensive) than the inferred conclusion. This is sometimes the case, but not always. What is essential for a valid deduction is neither the truth of its premises nor their greater generality relative to the conclusion, but the presence of such relations between premises and conclusion

that the conclusion must necessarily be true in case the premises are true.

A deduction of any degree of complexity involves the construction of a series of statements (or proof), where each statement in the series is either one of the premises or is derivable from earlier statements in the series in accordance with certain rules of inference. Most persons, however, are unaware of the rules of inference which they employ in making deductions, and derive conclusions from premises simply by recognizing intuitively the connections between the familiar meanings of the statements involved. It is part of the task of logical theory to make explicit the rules of derivation implicit in habitual deductive inference, and to propose further rules which will cover situations where intuitive apprehension of connections of meanings is unreliable. The explicit formulation of such rules serves as a means for a more effective check on proposed proofs, and it facilitates the analysis and construction of comprehensive deductive systems.

The rules codified in the traditional logic of Aristotle deal for the most part with syllogistic inference, in which a conclusion is drawn from two premises possessing certain forms. Among the most important of these classical principles is the rule which validates the deduction of a conclusion B from premises having the forms "If A then B" and "A"; and also the rule which declares as invalid the inference of A from premises having the forms "If A then B" and "B." Developments in logic since the mid-19th century have led to the codification of many more such rules, so that types of deductive arguments can now be analyzed which cannot be handled by traditional techniques.

Deductive inference is sometimes charged with sterility and circularity. It is allegedly sterile because nothing is revealed by such an inference which is not already implicitly assumed in the premises. It is allegedly circular because the premises of a deduction cannot be asserted as true unless whatever is logically implied by them is known to be true, so that a deductive proof of a conclusion is question begging. The first charge is readily answered, however, by distinguishing between logical and psychological novelty. The conclusion of a valid deduction is undoubtedly implicit in the premises and contains nothing that is logically novel relative to them. Nevertheless, the conclusion is usually novel psychologically, in the sense that until it has been made explicit by way of deduction, no one may be aware that it is contained in the premises. Thus, although the axioms of Euclidean geometry imply the proposition that the circle is the plane figure having the maximum area for a given perimeter, most students of geometry are surprised when they first discover this theorem to be implicit in the axioms.

The second charge can also be met, by noting that the role of deduction in inquiry is not exhausted in the derivation of consequences from premises known to be true. This role includes, as we have noted, the derivation of consequences from assumptions, so as to make possible the gathering of relevant evidence for them. The construction of hypothetico-deductive systems (as in geometry, mechanics, chemistry, genetics, and economics) also serves as a means for integrating and correcting isolated beliefs, and for making such beliefs consistent with other parts of our knowledge. Moreover, it is by way of deduction

from comprehensive theoretical assumptions that explanations are supplied, predictions effected, and new lines of experimental inquiry frequently suggested. Deductive inference is an indispensable phase in the advancement of knowledge. See also LOGIC.

ERNEST NAGEL,

Professor of Philosophy, Columbia University.

DEE, John, English mathematician and astrologer: b. London, England, July 13, 1527; d. Mortlake, December 1608. He was educated at St. John's College, Cambridge (B.A., 1545; M.A., 1548), studied in Louvain from 1548 to 1550, and then went to Paris, where he lectured on mathematics. Returning to England in 1551, he received an annual pension which he subsequently exchanged for a living at Upton-upon-Severn. Since his Cambridge days he had been suspected of sorcery, and shortly after the accession of Mary I he was imprisoned on a charge of practicing magic against her life. He was freed in 1555, and after Elizabeth I's accession was consulted as to a propitious day for her coronation. The new queen held him in high regard. In 1578, when she was ill, he was sent to Germany to consult with physicians on her health, and in 1580 he prepared for her two rolls giving geographical and hydrographical accounts of newly discovered territories. An advocate of the Gregorian calendar, he made in 1583 preparatory calculations for its possible adoption on England. Dee's astrological and alchemical activities aroused much suspicion, however, and in 1583 his home was invaded by a mob. For several years he traveled in Poland, Bohemia, and Germany, engaging in crystal gazing and magic. In 1589 he returned to England, and from 1595 to 1604 served as warden of Manchester College. He was the author of 79 works, including *Monas Hieroglyphica* (1584) and *The Compendious Rehearsal of John Dee* (1592).

DEE, the name of three British rivers, two in Scotland and one in England and Wales.

(1) The longer of the Scottish Dees rises on the slopes of the Cairngorm Mountains in Aberdeen and flows generally east, partly in Kincardine, for 90 miles to the North Sea at the city of Aberdeen. One of the best salmon rivers in Great Britain, it is noted for its scenery.

(2) The second Scottish Dee, a small river used for power, rises 10 miles west-northwest of Dalry in Kirkcudbright and flows southeast and south for 50 miles to Kirkcudbright Bay, an arm of Solway Firth.

(3) The third Dee, in Wales and Cheshire, rises in Bala Lake, Merionethshire, and flows northeast and north for 70 miles to the Irish Sea, which it enters through a broad estuary celebrated in Charles Kingsley's *Sands of Dee*.

DEED, a legal instrument conveying the title to real estate. The term includes conveyances of interests less than the entire title, such as life estates and easements, but ordinarily excludes leases. A deed must be executed with certain formalities; must transfer a present interest, rather than being operative upon the happening of an event in the future; and must be delivered and accepted. It need not be recorded in order to pass title from the grantor to the grantee, but failure to record may invalidate it as against subsequent bona fide purchasers or creditors. The validity, interpretation, and effect of a deed are

determined by the law of the place in which the land is situated.

The formal requirements of a deed are that it must be signed by the grantor or his agent, and be attested and acknowledged (see ACKNOWLEDGMENT) pursuant to the applicable statutory provisions. As a general rule, a seal is no longer necessary, although at common law it was essential to the validity of a deed. In order to qualify as a valid deed, an instrument must be delivered voluntarily by the grantor to the grantee or his agent, and must be accepted on the part of the grantee, with the mutual intention of passing title or some other interest in the property described. The deposit of a deed with a third person for delivery to the grantee on the fulfillment of a condition or the happening of an event (called a delivery in escrow) may constitute a valid delivery. (See also ESCROW.)

Unlike a contract, a deed does not require consideration and can effectively pass title even where a mere gift is involved, except in the case of gratuitous conveyances in fraud of existing creditors. The lack or inadequacy of consideration, however, may be an important factor in determining whether a deed was induced by fraud or undue influence. A forged deed is absolutely void and passes no title, either to the grantee or to subsequent innocent purchasers. Forgery, in the law relating to deeds, includes not only a falsified signature, but also the making of a material alteration in the deed with intent to defraud; and in some jurisdictions it has been extended to include the fraudulent procurement of the grantor's signature.

Generally, a deed procured by fraud is not absolutely void, but is only voidable. This means that the conveyance can be nullified, at the election of the grantor, as against the grantee and others who know or who, through the exercise of ordinary diligence, ought to know of the fraud. A bona-fide purchaser, however, taking title in ignorance of the fraud practiced on the original grantor, can acquire a good title to land previously conveyed by such a deed. The failure to perform a promise to do something, such as to pay money, made at the time of execution of the deed is not fraud, unless the intention not to perform was already in existence at the time the promise was made. A deed which is voidable for fraud, rather than entirely void, stands as an adequate conveyance of the property described until it has been rescinded or canceled by appropriate court proceedings instituted by the grantor. A deed procured by duress, practiced by the grantee or by a third person with his knowledge or consent, is voidable in the same manner, and under similar rules, as an instrument obtained by fraud. Other factors which can render a deed voidable are undue influence, which may be defined as the domination of the grantor's power of voluntary decision by the will of another; and material mistake of fact, such as a misdescription of the land conveyed.

No particular form of words is required in a deed, provided the deed indicates who is granting the property, to whom it is granted, what the property is, and that there is an intention to convey an interest in the property at the present time. In the construction and interpretation of deeds, the underlying principle is the ascertainment of the intention of the parties, particularly that of the grantor. If the language of a deed is unambiguous, courts will not resort to arbitrary rules to construe it, and similarly will not attempt

to discover an unexpressed or secret intention. Where two or more constructions are possible, the one which renders an instrument operative will be favored over that which makes it void. In cases of ambiguity, doubts will be resolved against the grantor, and the construction favoring the grantee will be selected.

Consult "Deeds," *American Jurisprudence*, vol. 16 (San Francisco 1938; supplement 1953).

RICHARD L. HIRSHBERG.

DEEMS, dēmz, **Charles Force**, American clergyman and writer: b. Baltimore, Md., Dec. 4, 1820; d. New York, Nov. 18, 1893. He was graduated at Dickinson College in 1839, became professor of humanistic studies in the University of North Carolina (1842-1848); of natural sciences at Randolph Macon College, Va. 1847-1848. Becoming a Methodist minister at Newbern, N. C., he was from 1850-1854 principal of the Greensboro Woman's College, N. C. From 1866 to his death he was pastor of The Church of the Strangers of New York City. He founded the American Institute of Christian Philosophy in 1881, and edited its journal *Christian Thought*. A lectureship in philosophy was founded at New York University in his name in 1905.

Included in his publications are *Triumph of Peace and Other Poems* (1840); *The Light of the Nations* (1870); *Weights and Wings* (1872); *Life of Jesus* (1872); *Scotch Verdict in re Evolution* (1885); *The Gospel of Common Sense as Contained in the Canonical Epistle of James* (1889); *The Gospel of Spiritual Insight and Studies in the Gospel of Saint John* (1891).

His autobiography with a memoir was edited by his sons (New York 1897).

DEEMSTER, dēm'stēr, an officer once attached to the high court of justiciary in Scotland, who formally pronounced the doom or sentence of death on condemned criminals. The office was conjoined with that of executioner. The name was given in the Isle of Man to two judges who acted as the chief justices of the island, the one presiding over the northern, the other over the southern division.

DEEMSTER, The, a novel by Hall Caine, called by the author the story of the Prodigal Son. It was published in 1877. The scene was laid in the Isle of Man, and opens in the latter part of the 17th century. The Deemster is Thorkell Mylrea, whose nephew Dan, the prodigal, deeply loves his cousin Mona; but her brother Ewan interferes and a duel ensues, resulting in the death of Ewan. Dan is tried and is declared cut off forever from his people, and banished to a remote corner of the island. During a visitation of the plague, Dan takes the place of Father Dalby, the Irish priest, effecting many cures and at last dying of the pestilence. A dramatization of *The Deemster* was produced by Wilson Barrett under the title *Ben-Ma-Chree*.

DEEP BOTTOM, Va., Battles at, two engagements of the American Civil War fought on the James River below Richmond in July and August, 1864. Gen. U. S. Grant, besieging Petersburg on the Appomatox River some 20 miles south of Richmond, on July 25 ordered an advance of Union forces to the north bank of the James at Deep Bottom, to threaten Richmond

from the east and thus compel Gen. R. E. Lee to weaken the defending forces of Petersburg before Grant's final assault on that city. The Union Gen. R. S. Foster with a brigade of the Tenth Corps crossed the James on a pontoon bridge west of where Bailey's Creek falls into it from the north, and at 2 A.M. of the 27th Gen. W. S. Hancock began crossing another pontoon bridge east of the creek, with the object of turning the Confederate left while Foster attacked the right. Among other Union general officers, who participated in the ensuing engagement were W. T. Sherman and Nelson A. Miles. The Confederate forces were led by Gens. Kershaw, Wilcox and Heth. The tactical objective was achieved on the 29th by which date five eighths of Lee's army had been drawn north of the James. Grant thereupon ordered a withdrawal south of the river. Union losses numbered 334 killed and wounded.

The second battle occurred after August 12 when Grant again ordered an advance across the James, as a threat to Richmond. The forces included Hancock's Second Corps, part of the Tenth, and Gregg's cavalry division. Hancock's corps marched to City Point and took steamers for Deep Bottom, 16 miles upriver, landing there on August 14. The cavalry and artillery moved by land. The attack started auspiciously and early on the 16th Gregg's cavalry had driven the Confederate cavalry beyond Deep Creek as far as White's Tavern, only seven miles from Richmond. But during the afternoon Confederate cavalry and infantry repulsed the Union cavalry and Miles' infantry brigade, driving them back across Deep Creek. There was no action on the 17th. On the 18th the Confederates attacked the Tenth Corps, but were repulsed. On the night of the 20th the Union troops began their retreat to Bermuda Hundred and Petersburg. The Union troops engaged numbered about 28,000, the Confederates, about 20,000. Union casualties numbered 2,786. There were no returns of Confederate losses.

DEEP-SEA EXPLORATION. Deep-sea exploration may be defined as the investigation of everything in the ocean. About three quarters of the earth's surface is involved. Most of the investigation requires the use of an ocean-going ship and the teamwork of a number of men representing all the major branches of science. The ship is the major piece of equipment which draws the team of scientists and the aggregate of deep sea problems together, just as the telescope does in astronomical science. The investigations cover the contours of the ocean floor, the physical and chemical properties of sea water, the currents, tides, and waves, the distribution of marine organisms and of marine sediments, and the meteorology of ocean areas.

Prior to the middle of the 19th century most deep-sea exploration was geographical in nature. Interest in the depths and the bottom configuration was stimulated by the introduction of trans-oceanic telegraph cables about 1860, which led to the famous expedition of H.M.S. *Challenger*. The *Challenger* Expedition (1873-1876) marks the beginning of modern deep-sea exploration.

Ocean Morphology.—The continents divide the water-covered part of the earth's surface into three oceans: the Pacific, the Atlantic, the Indian. All three are connected around the Antarctic continent, but the boundaries of the Pacific are

quite definite due to the archipelagos and submerged ridges which connect South America and New Zealand with Antarctica. The boundary between the Atlantic and Indian oceans is placed arbitrarily at 20° east longitude south of the Cape of Good Hope. Four smaller basins which reach oceanic depths are classed as large mediterraneans: the Arctic Ocean, the Philippine Sea, the Caribbean Sea—Gulf of Mexico, and the Mediterranean Sea—Black Sea. A class of still smaller deep basins, which is rather arbitrarily separated from the preceding, includes (among many others) the Bering Sea and the seas of Okhotsk and Japan.

The Pacific Ocean occupies almost half of the earth's surface (165,000,000 square kilometers). Its boundary is known to seismologists as the circum-Pacific earthquake belt and is characterized by active and extinct volcanoes, by narrow trenches which include the greatest of all oceanic depths, by island arcs, and by evidence of great vertical movements in the adjacent portions of the earth's crust within recent geologic time.

There are several extensive ridges and swells in the Pacific which reach heights greater than 1,000 fathoms, such as the Hawaiian Ridge and the Easter Island Ridge. The general depth of the Pacific Ocean basins is 2,500 to 3,000 fathoms and is essentially the same as that for other oceans.

The Atlantic Ocean occupies about 82,500,000 square kilometers. The continental margins bordering this ocean are characterized by extreme stability during the more recent geologic periods, the principal exceptions being the West Indian and the South Sandwich island arcs (which are included in the circum-Pacific belt by many writers) and the western extension of the Alpine belt. The most striking feature of the Atlantic Ocean Basin is the medial ridge which extends, with only one narrow break, for the entire length of the ocean and probably beyond the ocean's boundaries into the Arctic Basin and also into the Indian Ocean. In contrast to the Pacific Ocean, the principal earthquake activity in the Atlantic Ocean is along the Mid-Atlantic Ridge instead of along the boundaries of the ocean.

The Indian Ocean occupies about 72,500,000 square kilometers. The borders of this ocean resemble those of the Atlantic in having been generally stable throughout later geological periods. The principal exceptions are along the common border with the Pacific Ocean from Burma through Indonesia and probably from New Zealand to Antarctica. The Indian Ocean is similar to the Atlantic in having a branching medial ridge which is the site of considerable shallow earthquake activity.

Bottom Sediments.—The studies of Sir John Murray (q.v.) on the samples obtained by the *Challenger* and other ships led to his classification of deep-sea sediments as pelagic deposits and terrigenous deposits. The pelagic deposits are found far from land and consist of red clay, diatom ooze, radiolarian ooze, globigerina ooze and pteropod ooze. The terrigenous deposits are composed largely of materials transported from the continents and include blue mud, green mud, red mud, volcanic mud, and coral sand and mud. Although the usefulness of the classification on this basis is questioned, the general scheme of classification is still followed.

The pelagic deposits in water deeper than 2,700 to 2,900 fathoms are usually red clays ex-

cept in regions where siliceous organisms contribute to the sediments. It is generally held that the red clays are the residue from the solution of calcareous oozes by the deep waters which have a high concentration of carbon dioxide. In lesser depths the pelagic deposits are generally globigerina ooze except where the dominant planktonic forms are radiolarians, diatoms, or pteropods.

Significant concentrations of extraterrestrial or atmospheric dust occur only in the red clays, presumably as a result of the concentration of insolubles.

Research Ships.—For general deep-sea exploration it is necessary to have a vessel with a large cruising radius and the ability to work at sea for a long period. Laboratory space for chemical, biological, physical, geological, and meteorological investigations is required in addition to room for heavy and medium winches, which handle three to six miles of cable to permit dredging, coring, and other activities in all depths. For handling of bulky equipment and of large instruments considerable clear deck space and low freeboard are desirable. Freedom from excessive drift when hove to on station is also very important. Experience has shown that the smallest vessel which can meet these conditions should be chosen, otherwise the high cost of operation is likely to prevent a continuous program, unless the operation is by a national agency. Most privately operated oceanographic vessels have had 50 to 500 tons displacement and have been 75 to 150 feet in length. Even so, the operating budget of the research vessel is by far the greatest expense of deep-sea investigations.

Heavy winches usually have about 300 horsepower and will handle over three miles of one-half inch wire rope; hydrographic winches usually have about 20 horsepower and will handle a similar length of three sixteenths inch wire rope; sounding winches usually have about 2 horsepower and will handle at least 2,000 feet of wire usually one sixteenth inch or less in diameter. The heavy winches are used for dredging, trawling, coring, and anchoring in deep water; the hydrographic winches are employed for serial temperature measurements, water sampling, and lowering light instruments, such as cameras, small coring apparatus, and current meters; sounding winches and other light winches are generally used for very light equipment and for moderate depths, since these have been practically displaced by acoustical equipment for the measurement of depths.

The trend toward electrical aids to navigation, such as the gyrocompass, radar, loran, and continuous recorders of depth, course, and speed, has improved the accuracy of reported positions, but has made great demands on space and on electrical power.

Sounding.—The earliest deep-sea soundings were made with hemp rope and required that the ship be stopped for many hours. The introduction of piano-wire sounding machines eliminated the need for storing large volumes of rope, but did not greatly reduce the time required for a sounding. In 1911 Reginald A. Fessenden (q.v.) introduced his method of determining depth by means of the time required for obtaining an echo from the ocean bottom, making it possible to take soundings from a ship under way at full speed. The method, however, was not used widely until after World War I, the first trans-Atlantic cross-

ing with frequent soundings being that of U.S.S. *Stewart* in 1922. Continuous recording of depth as a function of time was introduced in the 1930's, but its use was confined to depths of less than 2,000 fathoms. A continuous recorder for all oceanic depths was installed on research vessel *Atlantis* shortly after World War II and covered almost 100,000 miles of track by 1950. Many vessels took similar recordings.

The major features of the ocean basins were determined before the introduction of sonic depth finders. The Mid-Atlantic Ridge, dividing the Atlantic Ocean into two basins, and the narrow trenches which parallel the island arcs and include greatest oceanic depths were well known. The opinion, widely held about 1920, that no significantly greater depths than those in these trenches were likely to be found, has proved correct.

Detailed knowledge about new isolated submarine peaks and even about new submarine mountain ranges was obtained rapidly in the years following World War II. H. H. Hess found that a large number of submarine peaks in the Pacific Ocean had flat tops at depths of 700 to 1,000 fathoms. It was found that the floors of the deep basins were very smooth over long areas, while in other large areas they showed extreme roughness on a scale so small that it would not have been discovered without instruments which recorded continuously.

The submarine canyons, which had been detected by wire soundings, were first surveyed in detail sufficient to permit serious study by geologists by the United States Coast and Geodetic Survey and were contoured by Fred M. Veatch and Paul A. Smith. By means of surveys with recording echo sounders it was possible to show that some of the canyons extended to depths of 2,500 fathoms.

Coring.—The systematic collection of samples of sediment from the bottom of the ocean in great depths came after Midshipman John M. Brooke (q.v.) had developed in 1852 a weighted tube, from which the weight became detached upon contact with the bottom. This arrangement made it possible to obtain samples with the light line and hoisting machinery used for sounding and it also greatly increased the value of the soundings by providing positive evidence of contact with the bottom.

Heavier equipment, consisting in all cases of a weighted tube with a check valve, which could be lowered to strike bottom as rapidly as possible, was developed by H. L. Ekman in 1876. No essential modification of this coring apparatus was made until 1935, when C. C. Piggot introduced a "gun" which drove the coring tube into the bottom by means of an explosion. Piggot obtained cores up to 10 feet in length, whereas the longest ones previously obtained were about 3 feet long. Piggot's work stimulated very fruitful efforts to make still better coring apparatus.

Mikael Juul Hvorsley and H. C. Stetson introduced the principle of free-fall, in which a trigger, hanging about 10 feet below the cutting edge of the weighted tube, operates a release mechanism allowing the tube to fall freely and greatly to increase the penetration. Kullenberg introduced a piston inside the free-fall coring tube, which was held in place at the level of the ocean floor as the tube penetrated the sediments. The effect of the piston was to overcome the friction of the sample inside the tube and to insure that the length of

the sample obtained would equal the depth of penetration.

About 200 deep-sea sediment cores were taken on the Swedish *Albatross* Expedition with the Kullenberg apparatus and about 150 cores on the *Atlantis* with an apparatus employing free-fall and a piston. Many cores up to 40 feet in length have been obtained and they undoubtedly opened a new era in the study of deep-sea sediments.

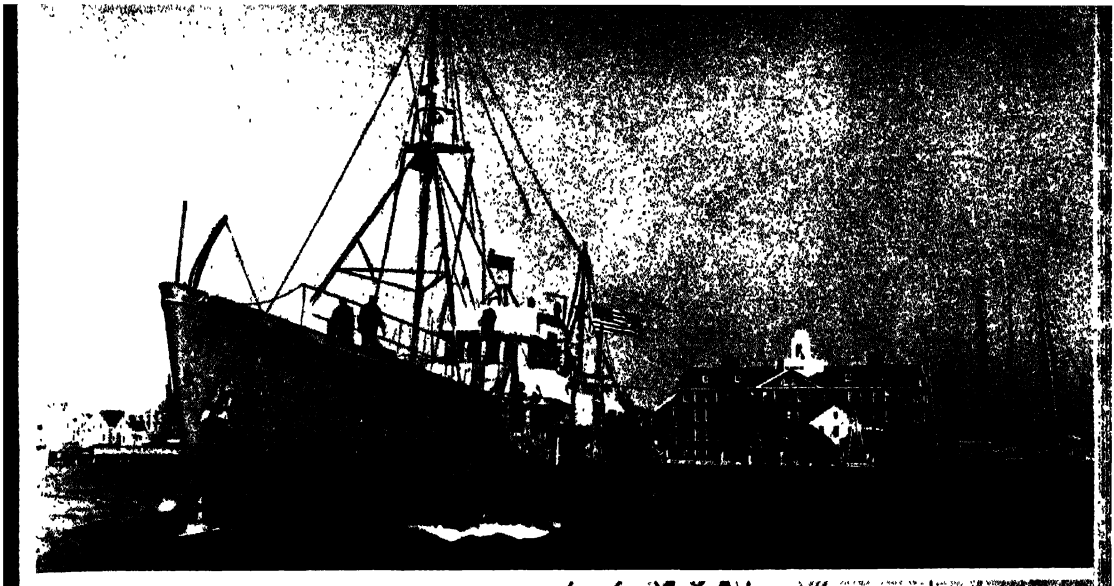
Preliminary study of the long cores showed that some of the generalizations based on shorter cores widely spaced were in error. Alternation between clay and ooze within a single core was observed in several cores and alternation between clay and well-sorted sand was found in many cores even in the middle of the deepest basins. On the continental slope and on the steeper slopes of seamounts and islands sediments of older geologic age (Tertiary), were found in many cases with little or no cover of modern sediments.

Photography.—Many biologists have taken black and white, color, and motion pictures in shallow water, both of the bottom and of organisms within the water. The first successful photographs of the bottom in water beyond the reach of divers were taken with a camera designed for deep-sea work by Maurice Ewing, B. H. Vine, and J. Lamar Worzel in 1940. More than 1,000 excellent bottom photographs were taken during the next decade in depths of a few hundred fathoms, and perhaps 100 in depths from 1,000 to 3,200 fathoms. These photographs were used to study the distribution of life on the ocean bottom, the form of the depositional surfaces, the character of outcrops of older sediments, the depth and directions of wave and current ripples, for the identification of wrecks, and for studies in the mortality of shellfish in relation to industrial pollution.

The apparatus consists of a simple camera in a watertight box having a plate-glass window able to withstand pressure in excess of 10,000 pounds per square inch. The camera is mounted near the top of a pole 10 to 15 feet in length, which, suspended from a wire, is lowered to the bottom. A trigger on the bottom of the pole causes the camera shutter to operate when the ocean bottom is reached. The light source is a photoflash bulb, protected from the water by a transparent case and mounted near the bottom of the pole. The area covered by a single photograph is usually a square 5 feet to 8 feet on each side.

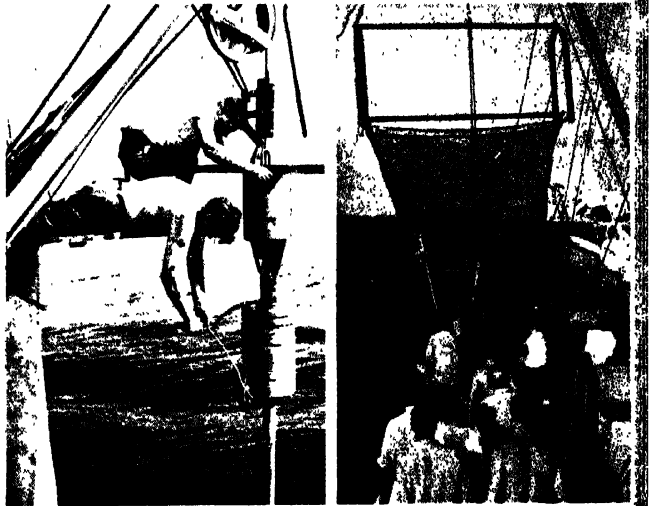
Gravity.—The measurement of the force of gravity at a network of oceanic stations is very important for the determination of the shape and the structure of the earth, and particularly so for the determination of the fundamental contrast between continental and oceanic crust. Measurements have demonstrated the important fact that the ocean basins and the continents are substantially in isostatic equilibrium. This means that the weight of a given area of continental crust accurately balances that of an equal area of oceanic crust, including the water above it. In other words, the rocks beneath the ocean basins are heavier than those beneath the continents and the levels at which continents and ocean basins stand are determined by their respective densities, as though the crust were floating upon a fluid substratum.

F. A. Vening Meinesz found striking departures from isostatic equilibrium in narrow strips

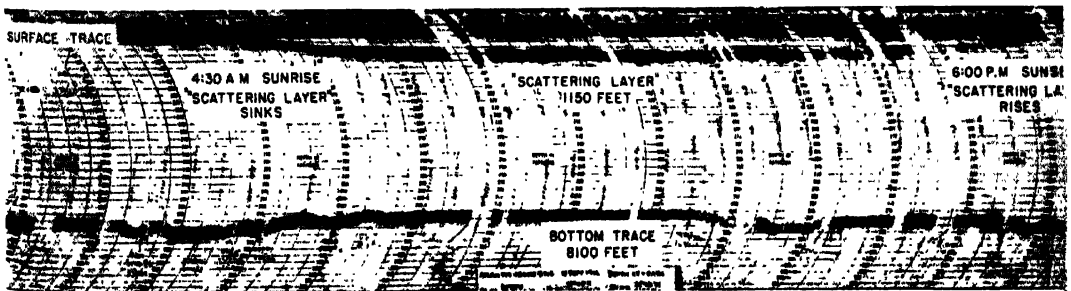


DEEP SEA EXPLORATION

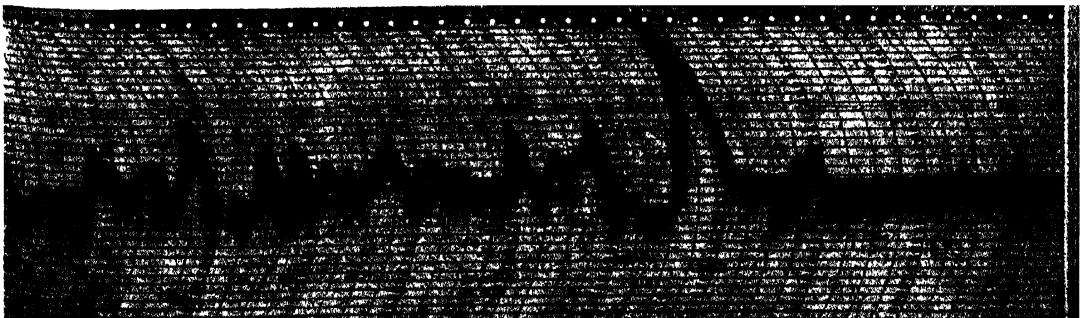
Top: Research vessel leaving Woods Hole Oceanographic Institution for four-month survey of equatorial currents. Right: Sediment coring tube about to be lowered to obtain a long core of sediment from the ocean's bottom. Such cores are used for geological studies of the age of the earth and the changes in climate which have taken place. Far right: The Blake trawl ready to be lowered overside. It will be towed over the steep submarine ridge which runs most of the way from Ice land to Antarctica.

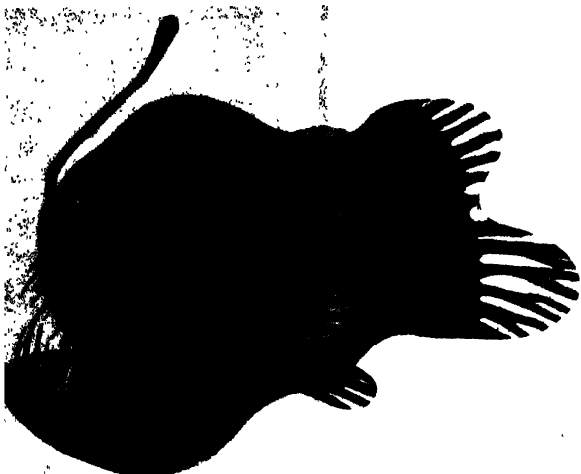


Courtesy Woods Hole Oceanographic Institution



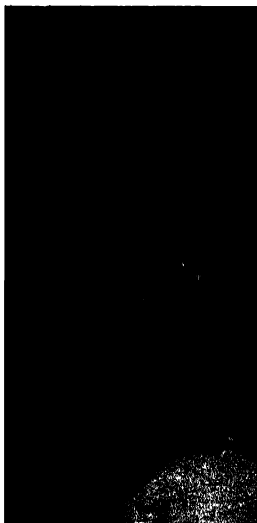
Above: Bathygram made by a recording echo sounder showing the mysterious "scattering layer" of sound reflection, found in deep water in all oceans, which sinks during the daytime and rises near the surface at night. Below: Recording of ocean bottom showing steep submarine mountain southwest of Bermuda





Melanocetus Krech A. BRAUER

Center left: Deep-sea animal, *Melanocetus Krech*, 4.65 centimeters from mouth to tail. Center right: A diatom, single floating microscopic plant, enlarged 767 times.



DEEP SEA EXPLORATION

Top of page: Rare snake mackerel caught about 400 miles east of Barbados in the West Indies. Far left: Steel dredge being lowered to be dragged along side of submarine mountain. Fragments of rock may break off, containing fossils which help determine age of rock. Left: Recording echo sounder runs continuously to indicate ocean depth. Ocean floor is as uneven as the land.

Courtesy Woods Hole Oceanographic Institution

which usually border the convex side of island arcs, such as the East Indies and the West Indies. The gravity anomalies have been interpreted as evidence of mountain-building processes in action at the present time along the borders of deep ocean basins.

When an adequate network of gravity observations over the ocean basins is available, it will be possible to determine with increased accuracy the deviations of the earth's surface from perfect sphericity, particularly those deviations which are related to the centrifugal force of the earth's rotation.

The measurement of the force of gravity at sea may be considered to have begun with the work of Vening Meinesz, who in 1923 first used a multiple pendulum apparatus, which he had devised for gravity measurements aboard a submerged submarine. After that time he made measurements at about 1,000 stations. Approximately 100 stations each were made aboard submarines of the British, French, Italian, Japanese, and Russian navies. Over 1,000 stations were made aboard submarines of the United States Navy. For all these measurements the apparatus was either that of Vening Meinesz or an alternative which used his principle of the fictitious pendulum. The only other work in this field which produced usable results was done by Hecher on three long cruises between 1901 and 1909, using a boiling point method, but the precision of this method is so low that only the largest gravity anomalies can be reliably investigated with it.

Trawling and Dredging.—Trawling and dredging in the deep sea are among the most difficult of all phases of deep-sea exploration. The trawl most commonly used for the capture of living organisms on the deep-sea bottom is the Blake trawl. There are many modifications and related devices, but they generally consist of a bag-shaped net about 20 feet long, fitted with a rectangular iron mouth 8 to 12 feet wide and 2 to 3 feet high. It is usually towed with a wire rope about one half of an inch in diameter. The ship must keep under way throughout the lowering to avoid fouling the net. As the trawl is not heavy and has great resistance to towing, it streams far astern, and the relation between its depth below surface and the length of wire paid out is uncertain. Since it is difficult to judge when contact with the bottom has been made, the pitfalls are either in not reaching bottom or in remaining anchored by the trawl, so that the area of bottom covered is insignificant, or in dragging the trawl too far, so that the bag is lost.

The dredges commonly used for obtaining rocks from the deep-sea floor have a bag about 6 feet long, built of iron links attached to a heavy, rectangular mouth about 4 feet wide and 2 feet high. The necessity for lowering under way and the danger of rupturing the bag are not present here, but there is a great added difficulty in the fact that the dredge must generally be dragged up a steep cliff to obtain rocks instead of sediment. To hit a cliff is a problem usually complicated by the fact that wind and current act upon the ship during lowering.

Essentially all of our knowledge of life on the deep-sea floor has come from specimens taken in trawls, but an important amount of information is obtained by submarine photography, which enjoys an advantage in that even the most active creatures are unlikely to evade the camera and

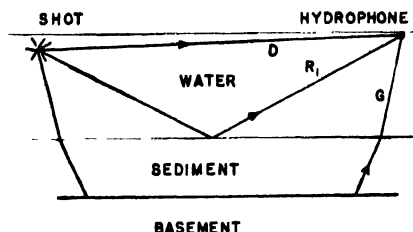
that organisms are seen in their natural habitat (including tracks and burrows). Zoologists have been reluctant to make identifications of animals from deep-sea photographs, partly due to the admitted shortcomings of a single photograph for this purpose, but largely because the original descriptions are based on specimens of which all have suffered the catastrophic effects of a rapid ascent in a crowded net and of which most have also been greatly altered by the preservative.

Rocks are obtained both in the rock dredge and in the trawl. Trawl operations over level bottom are suitable for studying the distribution of rocks by floating ice, while dredging operations on steep slopes have produced freshly fractured rocks indicating recent deformation of the ocean floor involving fracture or outpourings of lava.

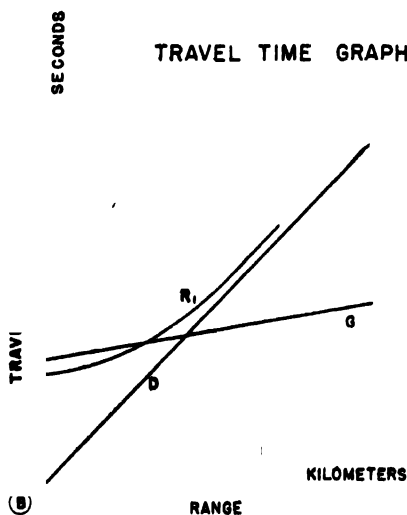
Earthquake Seismology.—The study of submarine earthquakes was begun soon after the first trans-Atlantic cables were laid, primarily to learn whether earthquakes broke cables and to seek cable routes which would avoid earthquake areas. The relation of earthquakes to cable breaks is complicated and not yet thoroughly understood, but it is well known that the principal earthquake belt in the Atlantic Ocean coincides with the Mid-Atlantic Ridge and extends into the Arctic Ocean. Secondary belts lie between the Straits of Gibraltar and the Azores and off the Cabot Straits.

The margin of the Pacific Ocean is the major earthquake belt of the earth, with deep, inter-

REFRACTION DIAGRAM



TRAVEL TIME GRAPH



(A) Ray diagram to illustrate ray paths used in seismic refraction measurements in the ocean. (B) Travel time curve from seismic refraction observations, from which thickness of sediment layer and nature of underlying rock may be calculated.

mediate, and shallow-focus earthquakes. The two island arcs which extend eastward into the Atlantic Ocean are usually considered as part of the circum-Pacific belt.

The absence of topographic relief within the basins is strong evidence that the present condition of low seismicity in these regions has persisted since the time when the basins were filled with water.

Seismology gives another type of information about ocean basins through the study of the propagation of earthquake surface waves along oceanic paths. Studies of dispersion in Rayleigh waves have shown that the granitic type of rocks, which form the continents, are entirely absent under the ocean basins and studies of Love waves have shown that layering, which characterizes the crust beneath the continents, is almost completely absent beneath the ocean basins.

The storms associated with tropical and extra-tropical low-pressure areas generate characteristic microseisms, when located over ocean basins. These microseisms may be detected hundreds of miles away and are used for tracking hurricanes. The theory of the generation of these microseisms is not fully elaborated, but a calculation shows that the periods actually observed would be expected from the crustal structure deduced from studies of explosion and earthquake seismology.

Explosion Seismology.—Land techniques of explosion seismology have been adapted to the study of ocean basins using the refraction method. Studies of the propagation of explosion sounds to distances of about 30 miles have shown that the ocean basins contain one to two kilometers of sediments overlying bedrock in which the velocity of sound is about seven kilometers per second. This velocity is characteristic of ultrabasic rocks, such as olivine basalts, and is definitely higher than that for typical continental rocks. This result is in full agreement with that derived from the study of earthquake surface waves.

The detailed nature of the transition from the granitic rocks of the continents to the ultrabasic rocks of the ocean basin is not yet known. See also OCEANOGRAPHY.

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MAURICE EWING and BRUCE C. HEEZEN,
Department of Geology, Columbia University.

DEEP-SEA LIFE. The surfaces of the oceans occupy around 140,000,000 square miles, or about two and one half times the area of all the dry land on earth. Around most of the big land masses we find a belt of shallow water, where the bottom only very gradually descends from the shores to about 100 fathoms depth. It is as though this gently tilted submarine coastal plain formed a pedestal for the continents and it is therefore known as the continental shelf. The continental shelves differ greatly in their width, from nothing to several hundred miles. Actually the entire bottom of the shallow North Sea is part of the European continental shelf, apart from a deep, but narrow, valley

which cuts across it along the Norwegian coast. There are other large seas over the continental shelf off the eastern coasts of Asia between the islands and the mainland. As a general rule the shelf will be narrow where high mountain ranges on land come close to the coast, and wide where broad plains run into the sea. So we find the continental shelf along the east coast of America far wider than along the west coast, and generally wider shelves around the Atlantic Ocean than around the Pacific. Due to the complexities of the coastlines, and inadequate deeper soundings, there is still a good deal of disagreement between estimates of the area of shallow waters over the continental shelves and banks. But the more detailed calculations at least seem to agree that water less than 100 fathoms deep occupies less than one tenth of the entire ocean area.

This leaves about nine tenths of the oceans, or twice the land area of the world as the domain of deep-sea life. From the edges of the continental shelves, the bottom of the continental slopes drops off more rapidly to a depth of about 1,000 fathoms, beyond which we are on the ocean bottom itself, where the general increase in depth again becomes more gradual.

The average depth of all the oceans as a whole, including continental shelves and slopes, is a little over 2,000 fathoms, or nearly 2.4 miles. This compares with a mean elevation of all land above the sea of only about half a mile.

But the depth of the oceans is not uniform. Again we find a relationship to the land forms, with the greatest "deeps" or deepest "troughs" and "trenches" occurring close to the regions of sharp mountain folding along the coasts. The deepest trenches in the Pacific are located in the western parts of the ocean near the coast of the Philippines and the Marianas and closely approach 6,000 fathoms.

Before the invention of echo-sounding equipment it was generally thought that the bottom of the oceans would present the appearance of plains, plateaus and gently rolling terrain. Now we know that it also has valleys and mountain ranges, and even canyons, to equal all the forms we find on land.

A knowledge of these submarine ranges, or "ridges" is particularly important for our understanding of the Atlantic Ocean. The Middle Atlantic Ridge divides this ocean into two separate deep-sea compartments throughout its entire length. The Walfisch Ridge further closes the eastern compartment from the Antarctic deep-sea to the south, while the western compartment remains open at the southern end. At the northern end both compartments are separated from the Arctic depths by a ridge extending from Scotland to Greenland via the Faeroes and Iceland. Similar major subdivisions are not found in the Indian and Pacific oceans. Submarine ridges are also very important by their separation of the depths of marginal seas, such as the Mediterranean, Caribbean, Okhotsk, Japan, and South China, from the depths of the open oceans.

The deep-sea bottom, including the continental slopes, is almost universally covered by a thicker or thinner layer of fine, soft deposits, which create a special problem for deep-sea bottom life. In order to stay on top of this ooze the deep-sea forms must spread their weight over a large surface, or lift themselves on stalks rising from the deeper and firmer mud. Spiderlike Crustacea,

stalked sea lilies, thin-shelled mollusks with long protuberances from their shells, the slender and "bristly" brittle stars, are therefore far more predominant on the deep-sea bottom than they are on the continental shelves, while heavy shells, short sedentary forms such as sea anemones, and compact crustacea such as shallow water rock crabs are virtually absent.

Exposed rock is limited to the sharpest peaks and ridges, and the more precipitous borders of trenches and gorges, and occupies an entirely insignificant part of the total ocean area. The hard sandy surfaces that are so common on the continental shelves are rare even on the slopes and virtually absent from the main ocean bottom.

The bottom deposits are of many kinds and of two main origins: biological and geological. The most important biological sediments are the Globigerina ooze formed in large part of the delicate, calciferous shells of Foraminifera, which are minute, single-celled animals. This covers the largest part of the Atlantic and Indian Ocean bottoms. A similar, but much less widely distributed deposit is the Pteropod ooze in which the tiny shells of minute pelagic mollusks play an important part. The diatom ooze is characterized by microscopic silicate shells of unicellular plants, but also contains a fair amount of calciferous matter. Among the deposits of geological origin the red clay far outweighs all others in importance. It covers almost the entire Pacific Ocean bottom and is present also in the deeper parts of the other seas. It is formed mainly by the disintegration of pumice and volcanic ash, carried out over the oceans, where it sinks. The color is the result of the presence of manganese. In tropical regions it sometimes receives a considerable addition of silicate skeletons of the microscopical Radiolaria, and this mixture is referred to as radiolarian ooze. Other deposits of geological origin, such as the blue, red, and green muds are mostly formed by materials washed out from the land, rather than carried out over the surface of the sea, and are therefore generally limited to the Continental Slopes and margins of the oceans. This is also true of coral mud.

It has been found that the calcium contents of the bottom deposits show a general decrease with increasing depth, from 60-80 (or even 90) per cent lime above 2,000 fathoms, to 1 per cent, or less, below 3,000 fathoms depth. This is related to the greater solubility of lime than of the silicates and other materials.

With an average thickness of water of over 2,000 fathoms to roam through, deep-sea life is not confined to the bottom. Many organisms continue to live a bottom life down to great depths, perhaps even exceeding 4,000 fathoms. These are referred to as "benthonic" forms. Others have adjusted themselves to spend their entire existence in midwater or near the surface, and are said to be "pelagic."

To be able to lead a pelagic life an organism must either be a tireless swimmer, although not necessarily a fast one; or it may use swim bladders or fatty substances to keep it afloat, but this is neither as advantageous nor as frequently used as is commonly thought. There remains a third, and by far the most important method, namely that of achieving suspension by friction, on the same principle that keeps a dust-cloud in the air.

The force driving a body downward, through air or water, is determined by its weight, which

is proportional to its volume. But the speed with which it sinks, or settles, is determined by the resistance to the downward movement offered by friction against the medium. Other things being equal, the friction is proportional to the external surface of contact between the body and its environment. The volume of a cube is the third power of the length of its side. But its surface is only related to the second power of its side, being six times the square of the side. If we double the sides of a cube we multiply its volume and weight by 8, but we only multiply its total surface by 4. The larger cube therefore has only half as much surface per unit weight as has the smaller cube. And the smaller we make our cube, the more surface, and surface friction, we get per unit weight. This is the reason why even heavy rock will stay afloat as dust in the air, when ground fine enough, and why an overwhelming majority of pelagic life relies upon a small, even microscopic size to help them stay afloat. Very commonly they also add to their surface by long spines, hairs, appendages and protuberances.

But, in relying upon friction to keep them afloat, they, by the same token, reduce their own ability to move about. Although most of them are capable of limited movements within a small radius, they are in a larger sense drifters at the mercy of the ocean currents. These pelagic drifters are called the Plankton. The larger and more self-reliant pelagic swimmers, such as fishes and others, are often, for distinction, referred to as Nekton.

Life in the sea as on land depends upon plants for the production of the organic substances which serve as the food of all organisms. The plants depend upon light as the source of energy for their production. But light of sufficient intensity does not penetrate very deep into the ocean, certainly not below 100 fathoms and usually less than half of that. Only on the upper part of the continental shelf is there a bottom for large plants such as seaweeds to grow upon in the light. In the open ocean the meadows and forests of the land are therefore replaced by an infinite dust-cloud of single-celled microscopic plants, forming that part of the plankton that is called the phytoplankton. Browsing upon the phytoplankton are hordes of minute animals, especially small crustacea, which form the zooplankton. The zooplankton, in turn, serves as the food of larger animals, among which are many of the commercially most important fishes and the largest of all creatures of the sea, the whalebone whales.

Some of the production of the phytoplankton gradually finds its way towards the depths, partly by direct sinking, but mainly from mouth to mouth, in the struggle for life. Since there is no production in the depths, and a lot of waste and combustion to provide animal energy on the way, the supply of food, and the abundance of life, diminish steadily downward. At the bottom itself, where all sinking must stop and a certain accumulation therefore takes place, we usually again find a slight increase in the abundance of life except at the greatest depths.

But the phytoplankton does not only need light, it also needs the same fertilizers that plants need on land. With bodies and excreta constantly sinking downward, the depths of the ocean become an enormous liquid compost for the plant life above, with phosphates, nitrates

and other essential substances in chemical solution in the sea water. Wherever water from the deeper levels is brought to the surface again by a gradual rise, or by the more abrupt, so-called, "upwellings," the phytoplankton is therefore greatly enriched and the entire abundance of life in the sea increased. In cold regions a turnover which may penetrate to considerable depths, results from the chilling of the surface water in the winter so that it becomes heavy and sinks. So fertilizer is brought to the surface each winter to provide for the tremendous "spring bloom" of the plankton in these regions. Especially in the Antarctic there is also a more gradual and steady rise of deep waters to the surface, where the giant whales grow fat on the results. In the tropical seas upwellings are particularly common on the eastern margins of the oceans, where the tradewinds blow the surface waters westward, away from the shores, and new water flows in to replace them. In the Atlantic the abundance of tropical ocean life is much greater off the African coast than off the West Indies. The islands of the Pacific make a comparison there much more complicated, but the tropical eastern Pacific, off the west coast of the American continents is also notably rich.

Animal life does not only need the food provided by the plants. It also needs oxygen to use the food, just as the plants need light to produce it. Oxygen may enter the ocean from the air, at the surface, but it does not penetrate very deeply by direct mixing. It is also released by the plants as a byproduct of the photosynthesis of organic matter. But plants are also confined to the upper layer. For its oxygen the deep-sea life must therefore depend upon the large-scale vertical circulation which ventilates the bottoms of the oceans. Where this circulation fails, as may happen in the depths of marginal seas and in a few special bottom areas, the water becomes stagnant and devoid of animal life.

The bottom of any container will be filled by the heaviest liquid that rises above its rim from the outside, while lighter liquids are pushed up and out. The gravity of sea water is determined by its salinity and its temperature. The greater variability of temperature makes it far more important than salinity in producing gravity differences in sea water. It is therefore the distribution of heat, rather than of the salts of the sea, that determines the vertical circulation. The coldest, and therefore heaviest, waters which have free access to the great depths of the oceans are those of the Antarctic. The waters of the Antarctic are constantly sinking to the bottom, flowing slowly northward along the bottom in all oceans. There is also a slightly less cold layer of Antarctic water flowing northward at higher, intermediate, levels, separated from the bottom by a mixed layer flowing south in replacement. Because the depths of the Arctic seas are barred from the Atlantic by the northern submarine ridges, the Antarctic provides by far the greatest part of the Atlantic bottom waters, and the flow from the south can easily be traced even north of Bermuda. In the Pacific there are sources of cold water in the north which make the vertical circulation less asymmetric, while the Indian Ocean can, of course, only receive its bottom waters from the south.

When it leaves the surface the oxygen contents of the cold water is in approximate balance with the oxygen contents of the air. The bottom

flow sinks relatively quickly to the depths where animal life is sparse, and the oxygen is therefore only used very slowly. Since cold water will absorb more of any gas than warm water can contain, the bottom water also starts with more oxygen than we find in the surface waters of warmer regions, and the oxygen is so slowly used that we commonly find more of it in the bottom layers of the tropical seas than at the surface itself, with a region of less oxygen (the "oxygen minimum layer") in between. The oxygen supply for deep-sea life is thus well provided for by a majestic vertical circulation which may take many years for a complete turnover.

This vertical circulation also creates an interesting vertical temperature distribution, with universally lower temperatures the deeper one goes, subject to only very minor irregularities. Beneath the warm tropical surface waters of 75°F., or more, we may always find sub-Antarctic temperatures of less than 40°F., below 1,000 fathoms. Both cold and darkness are the lot of deep-sea life. It is an amusing paradox that the lowest temperatures in the eastern compartment of the Atlantic are found almost exactly under the equator, because this is the point at which a stream of the Antarctic water flowing north in the western compartment enters the eastern basin through a pass across the Middle Atlantic Ridge.

The darkness of the depth may have been a cause of the evolution of many peculiar organs and forms, which seem adapted to cope with its difficulties. This seems particularly true of the development of luminous organs which may reach a very high complexity, with reflective layers behind the light source and lenses in front, and with the entire mechanism under voluntary control. The darkness also seems to provide shelter for many aberrant forms which would be unable to maintain themselves in the struggle for life exposed to enemies and competitors in the light. The darkness also seems to have limited the color scheme of deep-sea life. Among the pelagic forms we find almost exclusively black (fishes), a brilliant red (some fishes, the majority of crustacea), a few brownish jellyfish, and complete, colorless transparency (a few fishes, many invertebrates). The brilliant red is, of course, also black in the deep, red being the first color to disappear from the light as it enters the sea. Drab, dark brownish colors predominate among the bottom forms. Unusually vivid colors may, on the other hand, be displayed by the pelagic surface forms, with silvery, gold, striking blues and other nuances added.

The scarcity of food is probably related to some striking modifications, especially among carnivorous fishes depending upon large prey, but not often able to find it. Large mouths and stomachs, with the elasticity of rubber, enable some of these to swallow other fishes up to seven times their own weight, and thus to live after the manner of constrictor snakes.

Almost nothing is known about the qualitative problems of nutrition in the depths of the ocean. Since the natural production of vitamins generally seems to depend upon light, particularly in the case of vitamin D, shortages might be expected. Among the apparently normal peculiarities of many deep-sea fishes are some that bear a striking resemblance to the effects of rickets among other vertebrates. Similar peculiarities have never been found in shallow water.

but we can only guess at the reasons for their presence among the deep-sea forms.

The enormous pressures of the ocean depths are probably of no direct significance for the deep-sea animals, since their bodies contain only solids and substances (including gasses) in complete liquid solution, and the compressibility of liquids and solids is negligible as a purely mechanical factor. It is only in the presence of compressible free gasses that pressure has any great direct effects, either by crushing the cavities that contain the gasses or by driving the gasses into solution in the body fluids, or both. The deep-sea animals do not expose themselves to this danger, but it is the gasses in the lungs driven into solution in body which gives a diver the "bends" when they are released again, as bubbles in the bloodstream, under lower pressure.

Of the indirect, chemical, effects of high pressures upon the physiology of animals extremely little is known. It has been observed that the gill membranes of deep-sea cephalopods and fishes, through which they obtain their oxygen and discharge their carbon dioxide, are generally much smaller than in shallow water. Deep-sea fishes are often, even among voracious predators, characterized by a slowness of musculature which would make them capable only of very feeble efforts under other conditions. It is possible, and particularly indicated for the musculature, that these peculiarities may be related to chemical effects of pressure, but we again lack actual knowledge of what the explanation may be.

On the whole the depths of the ocean provide a cold, but well ventilated space for a sparsely, and perhaps poorly nourished existence, handicapped, but also sheltered, by almost total darkness. Life has made full use of the very limited possibilities, as it always does, often using some of its most complex adaptations to overcome the difficulties, and finding shelter for some of its most bizarre aberrations under the cloak of eternal darkness.

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A. E. PARR,

Director, The American Museum of Natural History.

DEER, animals of the family Cervidae (q.v.), which are noted for their grace of structure and their fleetness of motion. Since the earliest times they have been known as objects of the chase, and their meat, "venison," is considered a delicacy. The male deer is usually called buck, but the male red deer of Europe is a stag, or when mature a hart. The female is called a hind, or doe. In the language of medieval venery each kind of deer, and each age of growing buck, has a distinctive name.

All deer have a coat of short fur, dull in tone, ranging from reddish-brown to gray on the upper surfaces, and usually white below. Those that are marked bear such markings on the face and throat and on the tail. Only a few genera are spotted. In most genera only the young (the fawns) are spotted, and lose their spots when they are about one year old. Deer

breed annually, the young; one or two at a birth, being produced in late spring. The fawns remain with their mothers until they are about a year old, when they are sufficiently mature to become independent. The grass-land deer, especially, are gregarious, and often gather in large herds at the approach of winter. These feed on the meadow herbage, whereas the forest deer eat the leaves, twigs, and buds of bushes.

The deer is valued not only as food (it is the main subsistence of some northern tribes), but for commercial purposes. The skins make a peculiarly strong, soft leather, known as buckskin; skins with the fur on are not of much account, as the hair is brittle and soon disappears. The hoofs and horns are prized for ornamental purposes, especially the antlers of the roe deer, which are utilized for making umbrella-handles, and for similar purposes; and the elk-horn, often employed in making knife-handles. The Chinese also make a medicine from stag-horn and they eat the antlers of certain species when "in the velvet." The reindeer is as valuable to the people of the frozen North as the camel is to the desert traveler. The Indians of the region north of Hudson Bay and Great Slave Lake are almost wholly dependent on the caribou.

Deer have long been bred in captivity as ornaments for parks, but only in the case of reindeer has thorough domestication succeeded. Considerable attention is being paid in those parts of the United States where large tracts of wild land are available to breeding the American deer for market and this will doubtless become in the future an important source of meat supply.

The deer family is older than other families of ruminants, dating back to the Lower Miocene period, when they were very small and without antlers. With a gradual structural change in other directions, such as variations in dentition and increased size, the antlers have been produced and amplified, so that the deer of the present is a far larger and finer looking animal than his fossil ancestor. In the matter of antlers the young stag typifies the evolution of the race; as a yearling, his antlers are merely one pronged spikes; but each successive year they become more branched and forked until at maturity they may have seven or more branches. See articles under various English names of deer, as ELK; MOOSE; FALLOW DEER.

DEER FORESTS, large tracts of waste or uncultivated and mostly uncultivable land, chiefly situated in the Highlands of Scotland set apart as grounds in which the stag or red deer is hunted for sport, but is otherwise protected and allowed to roam in its natural wild state. The name forest does not in this case imply the existence of trees. As a matter of fact most deer forests are mountains or high-lying stretches of ground, exhibiting large areas covered with heath, in many places peat bogs, marshes, lochs or bare rock, elsewhere patches of grass or other herbage, while plantations of trees of greater or less extent may also occur. Some of the deer forests are of very great extent, the larger covering, say, from 50,000 to 70,000 acres. The counties in which they are chiefly situated are Sutherland, Ross, Cromarty, Inverness, and Argyle, while they also exist in Aberdeen, Banff, Forfar, Perth and Caithness. A number of them

are retained in the hands of their proprietors, while many others are let, either for the shooting season or for a period of years, and in this case may bring a large rental to their owners.

A deer forest is an expensive affair, first because of the rental charge, secondly, because of the number of employees in connection with it.

DEER-MOUSE (*Peromyscus leucopus*), the common white-footed mouse of North America, a rodent of the family Muridae. The main color of its body is buff or fawn, growing dark along the back, the feet and under parts being snowy white. With full, bright eyes, high, rounded ears, long whiskers and tail, graceful and sprightly movement, it is a very attractive little animal. It has been found to have small cheek-pouches. Its length rarely exceeds four inches, its tail being nearly as long. In different sections of the country its markings and habits are varied, and in some it seeks a home in the human dwelling, as do other mice.

DEER PARK, city, Ohio, in Hamilton County, 12 miles northeast of Cincinnati (of which it is a residential suburb); altitude 891 feet above sea level. It was first settled in 1888. The government is by a seven member council. Pop. (1950) 7,241.

DEER-STALKING, an exciting but laborious mode of hunting the red-deer, in which, on account of the extreme shyness of the game, their far-sightedness and keen sense of smell, they have to be approached by a cautious maneuvering before a chance of obtaining a shot occurs. Great patience and tact and a thorough knowledge of the ground are essential to a good stalker, who has to undergo many discomforts in crouching, creeping and wading through bogs, etc. Advance from higher to lower ground is usually made, since the deer are always apt to look to the low ground as the source of danger. Deer driving toward a point where the shooters are concealed is often practised, but is regarded as poor sport by the true deer-stalker.

DEERFIELD, village, Illinois, in Lake County, 25 miles north-northwest of Chicago of which it is a residential suburb; on the Chicago, Milwaukee, St. Paul and Pacific Railroad. First settled in 1835, Deerfield adopted its present name when the township was organized in 1850. Incorporated as a village in 1903, its government is by a president and six trustees. Pop. (1940) 2,278; (1950) 3,288.

DEERFIELD, Mass., town in Franklin County; alt. 204 feet; west of the Connecticut River; 33 m. N. of Springfield; on the Boston and Maine, and New York, New Haven and Hartford railroads. The surrounding region is agricultural, producing tobacco and cucumbers. The town, which includes Old Deerfield and South Deerfield, has a library and a high school, and is the seat of several private schools, including Deerfield Academy. The academy's first building, which was erected in 1798, is used as a historical museum. Old Bloody Brook Tavern, antedating 1700, is occupied by the Deerfield Art School. Settled in the years 1169 to 1672, Deerfield was a colonial outpost, and exposed to repeated attacks by the Indians. It was the

scene of the Bloody Brook massacre in 1675 and of a destructive raid in 1704. John Williams (q.v.), Deerfield's first pastor, was one of those taken to Canada by the Indians, who killed his wife and two of their children; he wrote of his sufferings in his book *The Redeemed Captive Returning to Zion* (1707). Pop. (1950) 3,086.

DEERFIELD RIVER, a river in Massachusetts, rising in southern Vermont and flowing generally southeast for 60 miles, when it enters the Connecticut River. The great fall of the river of nearly 1,100 feet in 50 miles furnishes water power at many places, of which the chief are at the Hoosac Tunnel and Shelburne Falls.

DEERFOOT, famous runner: b. Cattaraugus reservation, Buffalo, 1828; d. there, Jan. 18, 1897. A half-breed Seneca Indian, he was taken to England in 1861 and matched against the best long-distance runners, defeating nearly all of them. He lost a six-mile race against Mills in September 1861, but defeated White in a four-mile contest a few days later, and directly after outran both of those experts in a 10-mile championship. He beat Levett and Mills (12 miles) at Dublin for \$500 in 65 minutes, and Howitt—the "American Deer," in London (four miles). He made a record of 11 miles 720 yards in one hour (London, October 1862), and 11½ miles in one hour less six seconds (February 1863); another record was 11 miles and 12 miles in 57 minutes and 62 minutes respectively.

DEERHOUND, the Scottish greyhound used for deer-hunting. See Dog.

DEERSLAYER, *The*, a novel which was the last of the Leather-Stocking tales, which Fenimore Cooper published in 1841, its first in the order of events narrated in that famous series. The actions take place on and about Otsego Lake between 1740 and 1745. According to Cooper's own words, the "legend is purely fiction, no authority existing for any of its facts, characters, or other peculiarities," but "the descriptions of scenery in the tale are reasonably accurate." Essentially a romance, full of a dewy freshness, with large, bland, eloquent landscapes, and full of the forest philosophy which underlies the whole of Cooper's conception of Leather-Stocking, the book is at the same time, like all his later novels, considerably realistic. The dialect is careful, the woodcraft generally sound. The reality of the piece, however, comes chiefly from the reasoned presentation of the central issue: the conflict in Leather-Stocking between the forces which draw him to the woods and those which seek to attach him to his human kind. The same conflict had figured in earlier volumes of the series, but here it is more appealing than ever before because the hero is in the warm morning of his youth and must choose his career even against the enticements of love. It is hard to tell whether it is at the prescription of romance or at the demand of realism that he chooses his native forests; he is enough a romantic personage to prefer the wilderness, and yet his victory is not a romantic victory but a victory realistically in keeping with his total character. What helps him to his choice is that Judith Hutter,

who loves him, one of the few convincing young women in Cooper's works, has been corrupted by the settlements, and to turn from her is an act forced by his simple principles of virtue as well as suggested by his preferences for a life in nature. *The Deerslayer* is thus the tale of his coming of age. Already a hunter, as his name implies, he kills his first man. His distress at the realization seems immeasurably eloquent to readers who, knowing his future from the other *Leatherstocking* stories, remember the many deaths Natty has yet to deal. In other matters he is near his later self, for he starts life with a steady philosophy which, through all the many experiences of the volume, keeps him to the end as simple and honorable as at the outset. Of the minor characters only the ardent young Chingachgook and the silly Hetty Hutter are worthy of mention. The movement is rapid, the incidents varied, and the piece as a whole absorbing.

CARL VAN DOREN.

DE FACTO, *dē fāk'tō*, as a legal term, means in fact, actual, effective, in practical operation, or exercising dominion or sovereignty. The phrase has no exact or uniform meaning, appearing in such varied contexts as international law, where it is applied to the existence and recognition of governments; the law of private corporations, where it describes a business organization lacking some of the formalities of incorporation; and the law relating to municipalities, counties, courts, and public officials, where it denotes a condition of effective operation or existence falling somewhat short of full legal recognition. *De facto* is often contrasted with *de jure*, a phrase meaning "in law," which implies the fulfillment of all legal requirements and formalities.

International Law.—In the field of international law, a *de facto* government is one which is not permanently and constitutionally established or not fully recognized by other sovereign states. Such a government may result from a revolutionary uprising against a previously established governing authority or constitutional system; the invasion and belligerent occupation of a country by an enemy force; or the revolt and secession of a portion of an existing state followed by the establishment of an independent rule by the seceding portion. Although no exact definition of a *de facto* government is possible, it is generally agreed that, as a minimum requirement, it must be capable of organizing and maintaining effective control over the territory in question. When a sovereign power has been accorded diplomatic recognition by another state, it is said to be a *de jure* government as far as that other state is concerned. A government originating as *de facto* may thus become *de jure* when other countries decide that it is entitled to such status.

Recognition of a foreign state is regarded as a political function which can be exercised only by the executive branch of a government. Once recognition is granted, it becomes retroactive to the time when the *de facto* government was originally set up, so that the courts of the recognizing state will give effect to the decrees of the foreign government issued both before and after recognition. Although the courts have generally disclaimed any competency to decide questions concerning the recognition of foreign govern-

ments, they are frequently required to decide cases involving individual rights in which the status of another government is a determining factor. In such cases, the judiciary commonly takes cognizance of *de facto* situations abroad and gives some effect to the decrees of governments actually in power but not fully recognized by the political branch. The official acts, laws, and judicial decisions emanating from a *de facto* regime cannot be totally ignored by the courts; and, if performed in the normal course of civil and judicial administration, are usually regarded as valid in cases involving private rights. It is generally held, however, that the authority of a belligerent occupant as a *de facto* government is limited strictly to the confines of the occupied territory, and does not extend to the assets of that nation located abroad.

Corporations.—A *de facto* corporation is a business association which acts as a corporation and, for reasons of public policy, is treated as such by the law for most purposes, even though it has been imperfectly created. It is distinguishable from a *de jure* corporation in that the latter has been regularly formed in compliance with all legal formalities. The only practical difference between the two is that a *de facto* corporation is vulnerable to legal action by the state in proceedings contesting its right to exercise a corporate franchise. The essential elements in the establishment of a *de facto* corporation are the existence of a valid law under which the particular business might have been incorporated, a bona fide attempt to organize a corporation under this law, and the conduct of business affairs in a manner usually employed by corporations. If a *de facto* corporation is judicially determined to exist, the members of it are generally entitled to the same insulation from personal liability for its debts as are stockholders in a *de jure* corporation.

Consult Brown, Philip M., "The Legal Effects of Recognition," *American Journal of International Law*, vol. 44, p. 617 (Washington 1950) and Bishop, William W., Jr., *International Law*, pp. 221-224 (New York 1953).

DE FALLA, Manuel. See FALLA, MANUEL DE.

DEFAMATION, *dēf-ā-mā'shūn*, is the communication of disparaging or degrading statements concerning another person or his property. It includes libel (defamation in writing or other permanent form), slander (spoken defamation), and disparagement of title or property. See also LIBEL; SLANDER.

DEFAULT, *dē-fōlt'*, in law, constitutes a neglect to perform some act necessary to protect one's rights, or a failure to discharge a contractual or other legal obligation. A "judgment by default" is a decision in a lawsuit based upon a party's omission of a necessary legal step, such as the making of an appearance or the filing of a pleading, within the time required by law. Such a judgment generally has the same effect as one rendered in a contested proceeding.

DEFEASANCE, *dē-fē'zāns*, in law, is the nullifying or voiding of a deed or other instrument. As applied to deeds, the term means an instrument which defeats the force or operation of another deed. In this respect, a "defeasance" is distinguishable from a "condition," which is a provision embodied in the same deed to the

effect that, upon the happening of a certain event, the ownership or other interest previously created by the deed shall be terminated. In the law of sales, a "defeasance" is the rendering ineffective of a bill of sale by the performance of acts inconsistent with the transfer of ownership. If the buyer of an automobile, for example, receives a bill of sale and has it recorded, but allows the seller to retain possession of the automobile and sell it for him, such action may operate as a "defeasance," making the bill of sale inoperative as constructive notice of ownership. The effect will then be that the automobile dealer can make a valid sale, in good faith, to a purchaser who has no actual knowledge of the real owner's title.

DEFENCE OF POESIE, The, or APOLOGIE FOR POETRIE, an essay by Sir Philip Sidney (1554–1586) which, for the first time in English literature, outlined the history of poetry and defined its place in literature. Written in answer to the *Schoole of Abuse* (1579), a scathing attack on secular literature by the Puritan Stephen Gosson, it is an illuminating and definitive treatise on English poetry in all its forms from Chaucer to Sidney's own day. Its chief failing lies in its discounting of the quality of the work being done by Sidney's own contemporaries and its lack of vision as to its future eminence. First printed by Olney in 1595 as *Apologie for Poetrie*, it was reissued in 1598 under its present name.

DEFENCE OF THE REALM ACTS, a series of emergency measures passed by the Parliament of Great Britain following the outbreak of World War I. These acts, the first of which was passed on Aug. 8, 1914, prohibited the giving of vital information to the enemy; secured the safety of troops, communications, railways, and harbors; banned the spreading of false rumors; and limited any other activities which might endanger the war effort in any way. Offenders were punishable by court martial and, after the Defence of the Realm Consolidation Act of Nov. 27, 1914, the punishment was extended to include the death penalty. Some further modifications were made in the act during 1915 and 1916.

DEFENDANT, dē-fēn'dānt, in law, the person against whom a lawsuit or criminal prosecution is brought. A "defendant in error" is the winner of a suit in a lower court (whether he was originally the plaintiff or the defendant) against whom proceedings are brought in a court of appeal, in an effort to secure reversal of the lower court's judgment.

DEFENDER OF THE FAITH (*Defensor fidei*), the title bestowed on King Henry VIII on Oct. 11, 1521, by Pope Leo X in recognition of his *Assertio Septem Sacramentorum adversus Martinum Lutherum*, a Latin tract in vindication of the seven sacraments of the Roman Catholic Church against the tenets of Martin Luther. It was withdrawn by Pope Paul III in 1534, however, when Henry suppressed the religious houses in England and caused the Act of Supremacy to be passed, making him the spiritual head of the English church. Parliament conferred the title of Defender of the Faith on Henry in 1544, and it has since been so held by his descendants.

DEFENDER OF THE MARRIAGE TIE (*Defensor vinculi* or *Defensor vinculi matrimonialis*), an official, constituted in every diocese of the Roman Catholic Church, whose duty it is in petitions or suits for a declaration of nullity of the matrimonial contract to uphold and defend, with all his rightful power, the validity of the contract. He must be present, in person, at the various stages of the trial of a matrimonial cause, and have access to all of the records and all of the testimony. If the court decides for the nullity of the marriage, he has not only the right but also the obligation to appeal to a higher court against the sentence. In accordance with his demand, a further appeal to the highest court must be granted him. Since in the Roman Catholic Church a matrimonial cause which involves a sentence or judgment of nullity of a consummated marriage contract is not finally and absolutely determined and adjudged so long as either of the two parties to the suit is alive, the defender can insist on the reopening of the cause when some serious flaw appears in the judgment. (*The Code of Canon Law*, Canons 1586–90, 1967–69, 1990–91.)

Consult Dolan, John L., *The Defensor Vinculi, His Rights and Duties* (Washington, D.C., 1934).

CLEMENT V. BASTNAGEL,
School of Canon Law, Catholic University of America.

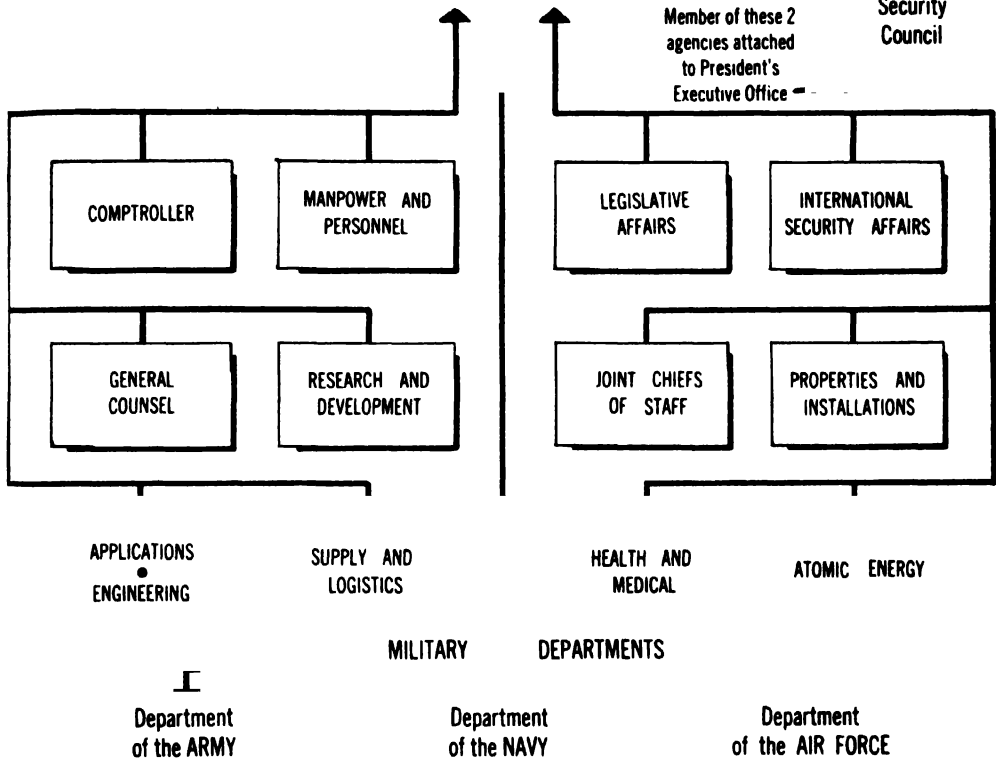
DEFENDERS, dê-fēnd'ērz, a political association of Ireland formed in 1784 to protect the rights of Roman Catholic tenants in Ulster and the northern counties which had been drastically curbed following the defeat of James II by William III at the Battle of the Boyne in 1690. The Defenders were defeated in open conflict with the Protestants at the Battle of the Diamond at Armagh on Sept. 21, 1795, but many of their number were later prominent in the uprising of 1797–1798.

DEFENSE, dê-fēns', in law, a denial of, or answer to, a complaint or allegation in a civil suit, or the act of contesting a criminal prosecution; also, the forcible repelling of a violent attack, as in the term "self-defense." In a technical sense, defense means a pleading filed in a lawsuit by the defendant, as a formal indication to the court of the grounds relied upon to defeat the plaintiff's cause of action. It is virtually equivalent, in this sense, to a "plea," and can include not only denials of facts alleged, but also new material of a factual nature or legal objections to the plaintiff's case. In connection with a suit for assault and battery, self-defense is considered the use of force against another person for the purpose of protecting oneself from bodily harm or an offensive contact. The right of self-defense can be invoked if the circumstances were such that a reasonably prudent man would have concluded that an assault was imminent. Similarly, in criminal prosecutions involving violence to the person, the accused may show justifiable self-defense to exonerate himself.

DEFENSE, Department of, a government department of the United States originally designated as the National Military Establishment by the National Security Act of 1947, but made an executive department of the government when the act was amended in 1949. This amending legislation was enacted to provide three military

DEPARTMENT OF DEFENSE

SECRETARY OF DEFENSE



departments, separately administered, for the operation of the United States Army, Navy, and Air Force, the last mentioned becoming a separate department of the government for the first time. Its enactment also provided for their coordination and direction under a civilian secretary of defense; for effective strategic direction of the armed forces; and for their integration into an efficient team of land, naval, and air forces without their being merged.

In June 1953, as a result of Reorganization Plan No. 6 of 1953, several agencies established by the National Security Act, as amended, and by the passage of other legislation, were abolished and their functions transferred to the secretary of defense. These agencies included the Research and Development Board, the Munitions Board, the Defense Supply Management Agency, and the Director of Installations. The plan further provided for six assistant secretaries of defense, in addition to the three authorized by the original act, and a general counsel for the department.

Office of the Department of Defense.—The agencies and positions under the Department of Defense, excluding the three military departments, are known as the Office of the Secretary of Defense. At the present time, it includes the secretary of defense, the deputy secretary of defense, nine assistant secretaries of defense, the

general counsel, an assistant to the secretary for atomic energy, the Armed Forces Policy Council, the Joint Chiefs of Staff, and the joint secretaries.

The nine assistant secretaries of defense are assigned individual responsibilities in the following fields: comptroller, manpower and personnel, legislative and public affairs, international security affairs, research and development, applications engineering, supply and logistics, properties and installations, and health and medical. The general counsel serves as chief legal officer for the department.

The Armed Forces Policy Council advises the secretary of defense on matters of broad policy relating to the armed forces, and is composed of the secretary and deputy secretary of defense, the secretaries of the army, navy, and air force, the chairman of the Joint Chiefs of Staff, the chief of staff of the army, the chief of naval operations, and the chief of staff of the air force. The commandant of the Marine Corps also serves as a member when Marine Corps matters are being considered.

The Joint Chiefs of Staff is responsible for the preparation of strategic and logistic plans for the unified direction of the armed forces and for advising the president, the National Security Council, and the secretary of defense on such matters. It is composed of the chairman, who is

a senior military officer but has no command, the chief of staff of the army, the chief of naval operations, and the chief of staff of the air force. The commandant of the Marine Corps serves as a co-equal member when Marine Corps matters are being considered.

The joint secretaries advise the secretary of defense on general problems confronting the department. Its membership consists of the secretary of defense as chairman, the deputy secretary of defense, and the secretaries of the army, the navy, and the air force.

ORVILLE S. SPLITT,
Office of Public Information, Department of Defense.

DEFENSE MECHANISMS. This term, used originally in psychoanalytic theory and now more commonly used in dynamic psychology, refers to methods of adjustment by which the individual defends himself against uncomfortable, unpleasant affects such as anxiety, guilt, or shame. In psychoanalytic theory, a mental mechanism is a method or device used by the ego in handling a basic drive such as love or hate. Sigmund Freud introduced the concept of defense as early as 1894 in a study of the defense neuropsychoses.¹ The term "defense mechanism" apparently was commonly used in psychoanalytic discussions in the first decade of the century. Ernest Jones, for instance, in a paper written in 1910 used the expression in the following significant sentence: "This force or resistance is a defensive mechanism which was kept from conscious mental processes that were either primarily or secondarily (through association and transposition) of an unacceptable nature."²

Freud has made defense the key to his later theory of anxiety, the defense mechanisms being methods for warding off anxiety. Probably the most definitive statement of the defense mechanisms is to be found in the book by Anna Freud (Freud's daughter), *The Ego and the Mechanisms of Defense*, in which she discusses defense under the headings of "defense against instinct," "defense against affects," and "permanent defense phenomena" (character defenses). It is probable, however, that all of these are motivated by the need to defend or fortify oneself against anxiety. But it is recognized that the natural expression of the instincts—aggression and sex—are among the most anxiety-provoking experiences, so that defense mechanisms are defenses principally against the unacceptable expression of these impulses.

A number of specific defense mechanisms have been isolated and named, including repression, fixation, regression, displacement, introjection, projection, reaction formation, and rationalization. Probably repression is the most primitive of these several mechanisms, for by means of repression an individual shuts off from conscious awareness memories of the circumstances which arouse anxiety and, through inhibition, blocks the discharge or expression of an impulse. There are many forms of partial inhibition which find expression in personality. Inhibition may be translated into passivity or inactivity. An individual may avoid anxiety-arousing ideas by with-

drawing from competition, retreating into illness or physical incapacity, or abbreviating response into gestures or tics. Partial inhibition may also be expressed by passive social withdrawal, by resistance or negativism. One may defend himself against anxiety when caught between the desire for expression and the need for inhibition by such a compromise as doubt or indecision.

The ego, however, has at its command several other methods for defending itself against anxiety. It may attempt to *escape* from the conditions which might arouse the expression of the impulse by such mechanisms as regression, flight to fantasy, or hyperactivity. It may seek to *disguise* the true meaning of the impulse by such mechanisms as displacement, introjection, or projection, or it may *modify* the expression of the impulse as in reaction formation, compensation, or sublimation.

Defense mechanisms are universal forms of adjustment, and in and of themselves are not to be judged good or bad. The value to be placed on a mechanism depends on the use to which it is put and on the outcome. Inhibition is good if it helps the individual restrain his action for the social good, but it is bad if it causes distressing conflicts which force the individual to find some neurotic solution.

Bibliography.—Freud, Anna, *The Ego and the Mechanisms of Defense*, International Psychoanalytical Library, no. 30 (London 1937, New York 1946); and Symonds, P. M., *The Dynamics of Human Adjustment* (New York 1946).

PERCIVAL M. SYMONDS,
Teachers College, Columbia University.

DEFENSE POLICY OF THE UNITED STATES. See ARMY OF THE UNITED STATES, CONSCRIPTION; UNITED STATES—34. *Defense Policy of the United States.*

DEFFAND, dĕf-fān', MARQUISE DU (real name MARIE DE VICHY-CHAMROND), French intellectual: b. Château de Chamrond, France, 1697; d. Paris, Sept. 24, 1780. Following her marriage to the marquis du Deffand in 1719, she embarked on a brilliant social career in the course of which she came to know Fontenelle, Voltaire, and Hénaut. She left her husband in 1747 and set up a separate establishment to which the philosophers and writers of France flocked. Despite the fact that she became blind in 1753, the brilliance of her gatherings remained undiminished, and distinguished figures, among whom were Montesquieu, d'Alembert, the Duchess of Choiseul, Hume, and, after 1765, Horace Walpole, were constant visitors. Her correspondence with them, and with other well known figures, written in a lively and highly articulate style, was published in 1810.

DEFIANCE, dē-fi'āns, city in northwestern Ohio at the confluence of the Auglaize and Maumee rivers. The county seat of Defiance County, it lies 50 miles southwest of Toledo, and is served by the Wabash and the Baltimore and Ohio railroads. The surrounding region is one of diversified farming, although the city itself is industrial, producing machinery and machine tools and parts; radio and service station equipment; and automobile parts and accessories. Defiance is a well known trading and shipping center, and there are also dairy products processing and refrigeration plants and a steel foundry. The city, which was settled in 1790

¹ Sigmund Freud, "The Defense Neuro-psychoses," *Collected Papers*, Vol. I, The International Psychoanalytical Library, No. 7 (Hogarth Press, London 1924).

² Ernest Jones, "Freud's Theory of Dreams," *American Journal of Psychology*, Vol. 21, pp. 283-308 (1910).

and incorporated in 1836, has a council form of government headed by a mayor. It is the site of Defiance College and of Slocum Museum. General Anthony Wayne built Fort Defiance here in 1794 during his military campaign against the Indians and the British. Pop. (1950) 11,265.

DEFIANCE COLLEGE, a coeducational institution in Defiance, Ohio. Founded in 1850, and opened in 1885, as the Defiance Female Academy, it became a college in 1902. Owned by the Congregational Christian Churches, it offers general academic, music, normal, and commercial courses, and in the 1953-1954 academic year had 26 professors and instructors and 208 students. It is affiliated with the Christian Biblical Institute.

DEFICIENCY DISEASES. The essential components of the diet of man are protein, carbohydrate, fat, vitamins, minerals and water; and certain trace elements which occur in the body in minute amounts, the importance of some of which is certain, of others dubious. Partial or complete privation of one or the other of the essential components leads to what is known as nutritional deficiency disease. Four general facts must be emphasized.

First, while under experimental circumstances dietary deficiency of a single constituent can be achieved and a *pure* nutritional disorder produced, this rarely happens under the conditions of human life. While naturally occurring nutritional disease in man may be due principally to privation of one dietary essential, deficiency of another is usually implicated. This complexity led to considerable confusion in the early days of the study of nutritional disorders, since the naturally occurring phenomena failed to duplicate what would have been predicted from experimental observation.

Second, nutritional privation must be regarded as relative. It is relative, for example, to rate of growth. The requirement of virtually all nutrients is greatest during infancy and decreases thereafter as the speed of growth slows. Then, too, the requirement of one constituent is also relative to the intake of another; since thiamine is involved in the metabolism of carbohydrate, there is greater need for this vitamin when the diet is high in sugar than otherwise.

Third, the elements of nutrition are normally taken by mouth and are absorbed into the body after processing in the intestinal canal; anything which interferes with ingestion, preparation for absorption or absorption itself may lead to nutritional disease. Lack of appetite in the very young and the aged often results in refusal of food. The simultaneous intake of something which renders the nutritive material incapable of absorption is the equivalent of primary want. Finally, exaggerated activity of the alimentary tract which results in food being propelled from one end to the other faster than absorption can take place has the same effect.

Fourth, the efficiency of the kidneys in eliminating the undesirable end products of internal functions and in conserving the re-usable wastes must be taken into account. Reduction of the capacity of the kidneys to cast off or to conserve may closely simulate deficiency disease.

Protein is one of the main constituents of the tissues of the body. Not only soft tissues, such as skin, muscles and internal organs but

also the bones of the skeleton contain protein. Protein is also found in the blood serum where through its osmotic effect—known as serum *oncotic* pressure—it draws water into the blood system from the tissues. Moderate degrees of protein lack are signaled by retarded rates of gain in weight and growth in length. More severe privation causes a decrease in the concentration of serum protein, fall in oncotic pressure and defective withdrawal of water from the tissues, where it accumulates in abnormal amount with the production of what is known as dropsy or *edema*. Protein deficiency is virtually never pure or unique. What is known as Kwashiorkor disease—an African disorder which has as its symptoms, anemia, intestinal disturbances, swelling of the abdomen and extremities and heart trouble—is thought to be due chiefly to protein lack but doubtless represents other deficiencies as well.

Carbohydrate, i.e., the sugars and starches, is the largest, most abundantly at hand, cheapest and most rapidly acting source of fuel or energy for the body. Without a steadily available supply of carbohydrate there is rapid and progressive loss of weight, acidosis resulting from the excess of ketones which the body produces when it burns fat rather than carbohydrate, and death. The survival of individuals on hunger strikes can be indefinitely prolonged by the use of carbohydrates in small amounts. The effects of carbohydrate privation are illustrated by cases of severe diabetes which, although the supply be unlimited, the body is unable to utilize carbohydrate. Here the train of events mentioned ensues and, if untreated, death may follow in a matter of days after the diabetic state has achieved full severity.

Numerous experimental observations have demonstrated that the human individual can subsist in apparently unimpaired good health on a diet almost entirely free of fat. There is some evidence to indicate that lack of certain fatty acids may cause a skin disorder, eczema, in some persons. Fat is an efficient solvent for vitamins A and D; fat privation may be implicated in some cases of deficiencies of these vitamins.

The human body is exceedingly sensitive to privation of certain minerals. Sodium and chlorine, the components of common table salt, are the chief solutes in the liquid which fills the blood vessels and bathes all the body cells—the *extracellular* fluid—and which constitutes 20 per cent of the body weight of adults. Loss of sodium chloride through sweating causes heat prostration, characterized by weakness, pallor and collapse. Hence, the prescription of salt tablets to individuals exposed to prolonged high environmental temperatures. Because of the almost universal availability of the common salt, its want is not often felt. There is an uncommon disorder, Addison's disease, in which, because of disturbed function of the cortex of the adrenal glands, the body squanders salt through the kidneys and the symptoms of heat prostration are reproduced.

Potassium and phosphorus are the principal minerals in the fluid within the cells of the body—the *intracellular* fluid—which constitutes 50 per cent of body weight. Both minerals are so closely associated in nature with protein, the largest intracellular component by weight and volume, that privation of one without the other does not occur as the result of dietary deficiency alone.

Depletion of the body's store of potassium occurs most often in starvation, severe diarrhea, uncontrolled diabetes and protracted vomiting. The symptoms are weakness, listlessness and flabby paralysis of the extremities; in fatal cases the latter may begin in the legs and progress upwards to involve the muscles used in breathing. The transmission of electrical impulses through the heart is affected. This is shown by electrocardiographic examination, a test of considerable importance, for it permits the early recognition of *hypokalemia* (low blood potassium) in time to institute life saving treatment.

Nutritional disease due to depletion of phosphorus by any possible means is virtually inconceivable.

Calcium is widely distributed in nature. Its concentration in many natural foods is high enough to protect most adults from privation. However, in only milk and certain dairy products is the concentration sufficient to provide adequate daily amounts to infants, children and pregnant women. The efficiency with which calcium in the diet is converted to bone is controlled by exposure to sunlight and to intake of vitamin D. Relatively small amounts of this mineral will suffice if sunshine and the intake of vitamin D be adequate. The symptoms of calcium privation will be discussed in conjunction with vitamin D.

Iron is an integral part of hemoglobin, the pigment of the red blood cells. Its distribution in natural foods except milk is sufficient for the needs of man. Since milk composes the chief item of diet of infants in many parts of the world, symptoms of iron privation are restricted largely to this age. The characteristic manifestation is anemia, signalized by a relatively normal number of red cells of reduced size and abnormally lowered concentration of hemoglobin. This so-called nutritional anemia remains common in all parts of the world where infants are nurtured chiefly on milk. Although at one time extensively prevalent in the United States, it has been virtually eradicated by the early introduction of iron-containing foods to the diet of infants.

Iodine is essential to the synthesis of *thyroxine*, the hormone produced by the thyroid gland. Iodine is present most abundantly in foodstuffs grown at the lower altitudes of the earth and in particular those neighboring on the sea. It is apt to be quite scanty in mountainous and inland areas. Deficiency is manifested by enlargement of the thyroid gland with resultant *goiter*. While this swelling is usually moderate, it may be massive, disfiguring and even incapacitating, particularly if it compresses the trachea, or windpipe, and interferes with breathing. Within this century there were areas of the United States where many children showed some goiter at puberty, a period when the demands upon the thyroid are intensified, and where many adults had goiter to an extent which demanded modification of the fit of clothing about the neck. These phenomena have been almost obviated by the introduction of widespread use of iodized table salt.

The importance of magnesium in the human body is poorly understood. In experimental animals privation causes exaggerated irritability of the central nervous system with uncontrollable muscular tractions and spasms, the phenomenon being known as *magnesium tetany*. Magnesium tetany has been reported as a very rare occurrence in man. The authenticity of the cases so reported is doubtful.

The trace elements, among which may be mentioned copper, manganese, zinc and cobalt, have, in a general way, a position in the action of enzyme systems. These are the catalysts, accelerators or mediators by which the body carries out complex tasks of organic synthesis and disintegration of substances which will not form or break down when they or their constituents are placed together in a test tube. The amount of the trace elements in the body is so small and their distribution in nature so widespread that specific disease due to their lack is not known.

Vitamins and Enzymic Processes.—The recognition of the existence of vitamins, the gradual cataloging of their number and the precise description of their chemical structure paved the way for the development of the important concept of enzymic processes in the animal body. Vitamins are components of enzymes which many creatures cannot form and which must be secured from food. Lack of these essential fractions interrupts several chains of chemical action and causes diseases which are often serious.

Vitamin A is fat soluble and is found in highest concentration in fish liver oils and less abundantly in animal fats. The body can form vitamin A from certain yellow colored precursors known as carotenoids which occur in green and yellow vegetables. Deficiency can result not only from insufficient intake but also, instructively, because of the ingestion of some fatty substance such as mineral oil in which the vitamin is soluble but which cannot be absorbed from the intestine, causing the vitamin to be wasted in the stools.

Vitamin A forms conjugated compounds with protein and in this way becomes a part of the visual purple, *rhodopsin*, and the visual violet, *iodopsin*; one of the early signs of vitamin A deficiency is night blindness. It is also necessary for the integrity of certain epithelial membranes; in its lack these membranes become thickened and hardened. The changes involve the eyes, bronchial tree, pancreas, urinary tract and sometimes other systems.

Vitamin B forms a water soluble complex of ten components which are found closely associated in nature. The ones which are important to man are thiamine (B_1), riboflavin (B_2), nicotinic acid, and pyridoxine (B_6). The other members which have been identified experimentally but which have not been proved to be essential to man are choline, panthothenic acid, pteroyl glutamic acid, inositol, biotin and vitamin B_{12} . The B complex is closely associated with portions of grain which are apt to be discarded in milling. Historically, vitamin B deficiency was first recognized in individuals subsisting chiefly on a diet of polished rice. It is common among chronic alcoholics.

Thiamine deficiency leads to a general disturbance in carbohydrate metabolism. Associated with this is a form of paralysis involving chiefly the extremities and known as polyneuritis, reduction of sensation in the arms and legs, and heart trouble. The disorder is known as beriberi. A "dry" form with polyneuritis alone and a "wet" form in which there is dropsy due to heart failure are recognized. Mental symptoms, while not the rule, are not uncommon.

Deficiency of riboflavin is characterized by irritative changes on the lips and at the angle of the mouth known as *perleche*. The tongue is purplish in color and may be ulcerated. Scaling ap-

pears in the folds of the face. The blood vessels of the eyeball may be dilated and exuberant. There is sometimes cataract. Mild forms of this deficiency are not uncommon in children even in the United States.

Nicotinic acid deficiency produces pellagra. The chief symptoms are loss of appetite, lassitude, inflammation of the tongue, changes in the skin, nausea, vomiting, diarrhea and mental confusion sometimes amounting to frank psychosis. The disease used to be common in the Southern part of the United States but has been largely eliminated through recognition of its dietary nature and the modification of the food habits of the people.

Pyridoxine deficiency results in failure to gain weight, progressive anemia and eventually convulsions. A number of cases of convulsions in infants caused by pyridoxine deficiency have been observed as the result of removal of this material from milk processed for the special use of this age group.

Vitamin B₁₂ occupies an unusual position. It is not a dietary requirement for most persons. However, certain individuals who are disposed to pernicious anemia can be protected against the disease by this food element. This fact and also the fact that it is found in nature in association with the B complex justify classing it as a vitamin.

Deficiency of vitamin C, known chemically as ascorbic acid, results in weakening of the tensile strength of tissues and ultimately in scurvy. Vitamin C is found in greatest abundance in citrus fruits. The earliest manifestation of privation is demonstrated by applying a tourniquet to an extremity and observing the occurrence of minute points of bleeding, known as *petechieae*, distal to the constriction. Scurvy is a more intense manifestation of the same blood vessel weakness. Formerly the disease was common among seafarers and others who went for many months without fresh fruit and vegetables. In more recent times it was chiefly a disorder of infants. Nowadays, thanks to the well nigh universal use of vitamin preparations in countries where citrus fruits are not a normal part of the diet, scurvy has almost disappeared from the infant population.

The symptoms of scurvy are caused chiefly by escape of blood from the vessels. If the infant has teeth there is frequently bleeding about their bases. The skin bruises easily and there may be spontaneous hemorrhage into the layers of the skin, a diagnostic feature known as *purpura*. Hemorrhage also occurs between the external surface of many of the bones and their cloak or *periosteum*; the joints are sometimes similarly affected. The extremities may be painful; the infant moves them with extreme reluctance and is said to display *pseudoparalysis*. The diagnosis of well advanced scurvy presents no difficulty. Confirmation may be secured by demonstrating the highly specific roentgenographic changes in the bones and by measuring the ascorbic acid concentration in the blood, which will be found to be reduced.

Intensive treatment with ascorbic acid produces dramatically prompt relief of symptoms. The speed and completeness with which the skeleton returns to normal are worthy of comment.

Vitamin D₂, or calciferol, and vitamin D₃, or irradiated 7-dehydrocholesterol, are intimately associated with the metabolism of calcium and phosphorus. The former is of vegetable origin and the latter comes from animal sources. It is the

vitamin which is present within the human skin where it is activated by exposure to sunlight. Vitamin D is required in the diet only in situations where normal solar radiation is insufficient for this purpose. This is the case throughout large areas of the temperate zone where climate, pollution of the atmosphere and other factors defeat exposure of the skin to the rays of the sun. The need for vitamin D varies directly in relation to the speed of growth; thus, the requirement of infants is highest and that of adults relatively low. The pregnant woman is an exception which is immediately understandable inasmuch as she is providing the nourishment for a very rapidly growing fetus.

The principal effect of vitamin D is to promote the absorption of calcium and phosphorus from food as it passes through the intestine; an effect of equal importance is to prevent these minerals from being wasted by the kidney. The more meager the supply, the greater the need for the vitamin.

Deficiency of vitamin D results in rickets in infants and sometimes in children, osteomalacia in women and rarely in men, and in tetany.

Rickets is a disorder in which the skeleton, which in its earliest developmental state is composed of cartilage, fails to secure enough calcium to permit its conversion into bone. The bones remain soft. For this reason the steady tonic traction exerted by the muscles which are attached to them as well as the force of gravity results in deformities of various kinds. Flattening of that area of the skull upon which the infant has been lying, distortion of the bones of the chest, bowleg and knock knee are the classical deformities. Advanced deformities can be incapacitating and even crippling. The situation as described used to be not uncommon even in the United States. Thanks to the substantially universal use of prophylactic measures, i.e., the systematic administration of vitamin D, rickets, even of the mildest sort has become so rare as to be something of a curiosity. A not uncommon mistake these days is the erroneous identification of certain minor and ephemeral peculiarities of the body build of infants as being rachitic.

Such cases of rickets as are seen today are usually not due to privation of vitamin D but are the result of other disturbances of the metabolism of calcium and phosphorus. Considerable biologic importance attaches to a rare variety of rickets, known as vitamin resistant or refractory; the distinctive feature is that it can be cured only by doses of vitamin D many times those usually required. This may be regarded as an experiment of nature the interpretation of which—if and when achieved—will yield clearer insight into the mode of action of vitamin D.

Osteomalacia is rickets in the adult. It is seen chiefly in those countries where the diet is low in calcium and where sunlight is not available, often because of local social customs. Thus it is commonest in India, China and like countries. Inasmuch as it is intensified by child bearing it is commonest in women. The features are not dissimilar from rickets if allowance is made for the fact that the individual is no longer growing.

Tetany occurs when the absorption of calcium is insufficient not only to permit bone to develop normally but also incompetent to sustain the normal concentration of calcium in the blood. The symptoms are exaggerated nervous and muscular irritability with resultant convulsions. One of

several classical tests is Chvostek's sign; this consists in momentary contraction of the muscles of one half of the face when a light blow is applied just above the angle of the jaw. Tetany can be fatal. The body possesses a safety device in the parathyroid glands, minute structures lying behind the thyroid gland in the neck. These glands have the ability to divert calcium from the bones and preserve a relatively normal concentration in the blood. The occurrence of tetany may be regarded as a failure or breakdown of this compensatory mechanism and to represent a state of hypoparathyroidism.

Vitamin E is a factor of importance for reproduction and muscular integrity in rodents; the human need is still doubtful.

Vitamin K is concerned with the synthesis of prothrombin, a factor involved in the clotting of the blood. Liver disease associated with jaundice may reduce its activity and lead to pathologic bleeding. There is also some evidence to indicate that it may be implicated in hemorrhagic disease of the newly born, a disorder in which there is abnormal bleeding at various sites. To safeguard against this some physicians prescribe vitamin K for pregnant women.

Water is the most insistent requirement of the body. Other deficiencies can be tolerated for comparatively lengthy periods but water lack can be borne but briefly. A deficit of water can result from restricted intake, also from exaggerated loss through the stools in diarrhea, through the kidneys, e.g., in diabetes mellitus or insipidus, or through the skin from sweating. The first step in compensation is restriction of urinary output when possible; the second is shifting water from within the cells into the blood vessels to protect the vitally important flow of blood without which survival is not possible. Last, the blood vessel system shrinks. When this is reduced to a certain minimum volume, *shock* supervenes, and if uncorrected, death ensues.

The kidneys need water as a part of their task of excreting minerals and other solutes. By somewhat reducing the need to excrete nitrogen and potassium carbohydrate reduces the need for renal water. This is exemplary of some of the physiologic facts which have been put into service in the formulation of concentrated rations to reduce the water requirements of castaways at sea. See also NUTRITION OF MAN; VITAMINS.

DONOVAN J. McCUNE, M.D.
Physician-in-Chief and Chief of Pediatrics, Permanente Medical Group, Kaiser Foundation Hospital, Vallejo, Calif.

DEFILEMENT, də-fil'mént. The corruption of the purity or perfection of one's person; the rendering ceremonially unclean. In many ancient religions and among most primitive tribes, the contact with strangers, or the habiliments of certain dignitaries, honored because of their ghostly powers, constituted defilement and could be exorcised only by ceremonial cleansing. More particularly these taboos extended to contact with dead bodies, as is shown by J. G. Frazer in *The Golden Bough*. The concept of defilement was also held in the Hebrew religion, and specific rules for purification were outlined in the Levitical Code. Among the Christians of the early church, the idea of defilement was largely symbolic, relating to the corruption of the soul by sin or evil motives, although the followers of St. Simeon Stylites (pillar saints) practiced a form

of sacrificial purification. The fundamental principle of monasticism from the early days of the church even until today is the escape from the moral defilement which is present in a worldly environment. Present-day Christianity's attitude toward defilement remains that which was held by the early Christian church.

DEFINITION, dəf-ī-nish'ūn (from the Latin *definitio*), signifies, in *lexicography*, a concise account of the essential and characteristic points of a person or thing. A definition should embrace all of the essential properties of the object to be defined, and omit any which do not belong to it, a procedure which is often extremely difficult because of the shades and gradations by which different things are blended. According to early scholastic logic, a definition must give the mark of the genus (*nota generalis seu genus*) and of the species (*nota specialis seu differentia specifica*); for example, a barn is a building (*nota generalis*) for the storing of corn (*nota specialis*). According to Aristotle, every strict definition could be divided into two distinct parts: the one dealing with the genus and the other showing the specific difference by which the given subject varies from others of the same order. Kant and his followers make definition a mere listing of the essential marks of an object, summed up without any distinction between genus and difference.

In *optics*, definition means the specific power of a lens to give a clear and distinct image of an object together with all important details.

DEFLATION, de-flā'shūn, a geologic activity of the atmosphere which is manifested in the removal of rock material by the wind, as opposed to mechanical wear or abrasion. It is characteristic of desert regions.

DEFLECTION OF THE PLUMB LINE, The. See ISOTASY; PLUMMET.

DEFOE, də-fō', Daniel, English journalist and novelist: b. London, England, 1660 or 1661; d. there, April 26, 1731. The son of James Foe, a London tallow-chandler, he assumed the surname of "Defoe" about the year 1703. The Foes were Presbyterians, and as the child of a religious household young Defoe naturally received a godly education. He was fortunate to come under the influence of the Rev. Charles Morton, who later became the first vice president of Harvard College. At Morton's academy he learned not only Latin but also modern languages, history, geography, and at least a little science. Above all, he was taught English composition.

When the time came for him to enter the ministry, he discovered that he had no vocation, and about 1680 he went into a haberdasher's business. In 1684 he married Mary Tuffley, and he appears to have extended his interests to wine, tobacco, and other merchandise. From various references in his writings, it appears that his commercial ventures occasionally took him to France, Spain, Holland, and Italy. He must have been in England in the summer of 1685 when, on his own showing, he was "in arms under the Duke of Monmouth," and in the winter of 1688, when he joined the forces of William of Orange, who was to remain Defoe's one great hero.

Always adventurous, he grew bolder in his commercial undertakings until in 1692 he was declared bankrupt for the large sum of £17,000.

Before long, however, he was able to compound with his creditors. He then opened a brick and tile factory on the outskirts of London and for some years his affairs prospered. A second bankruptcy in 1702 drove him out of business.

Interested though he was in trade, Defoe had already begun to give his attention to politics. In 1691 he published, anonymously, *A New Discovery of an Old Intreague*, a verse satire on a Jacobite plot, which was probably the first of his writings to appear in print. Some years later he became more deeply involved in political journalism, writing a series of able pamphlets in support of King William's policy of a European coalition against Louis XIV. In the spring of 1698 he gave an even clearer demonstration of the range of his fertile and inquiring mind in *An Essay upon Projects*. In this, his first real book, he put forward various suggestions for the betterment of his country, such as the improvement of the roads; the establishment of an income tax; an academy for women; insurance; and an asylum for idiots. To 1698 also belongs one of his raciest pamphlets, *The Poor Man's Plea*, in which he is concerned with a reformation of manners. Then, in 1701, he achieved fame as the author of a long doggerel poem, *The True-Born Englishman, A Satyr*. William of Orange had never been popular with a large part of his English subjects, and a persistent anti-Dutch feeling had recently found expression in John Tutchin's *The Foreigners*. Defoe's reply, which countered Tutchin's criticism by asserting that the English themselves were actually a mixed race of Danes, Normans, Scots, and others, proved to be surprisingly popular.

He was now personally known to the king, and he continued to serve him and his Whig ministers by writing against political corruption and the dangers of Jacobitism. His most daring intervention was to write and present to Robert Harley, speaker of the House of Commons, a paper called *Legion's Memorial*, in which, in the name of "the people of England," he protested against the imprisonment of five gentlemen of Kent who had begged the Commons to take proper steps to protect the country against invasion by the French. However, just when Defoe's future as a Whig pamphleteer seemed assured, his hopes were dashed by the death of the king on March 8, 1702. With the accession of Queen Anne, the political scene was transformed overnight. The queen let it be known that she would always have the interests of the Church of England at heart, and that she would feel bound to "countenance those who have the truest zeal to support it." This was almost an invitation to the High Church party to renew its attacks on dissenters. With the appearance in December 1702 of a violent pamphlet called *The Shortest Way with the Dissenters*, public feeling reached a new pitch of excitement. As the title indicated, the pamphleteer advocated the harshest possible measures to extirpate the dissenters. The High Tories were delighted, and the dissenters correspondingly alarmed. But a surprise was in store for all parties when, in January 1703, an advertisement appeared in the *London Gazette* offering a reward of £50 to anyone who could give information leading to the arrest of the author—Daniel Defoe. That brilliant and unpredictable dissenter had perpetrated a successful literary hoax, and had managed, by *reductio ad absurdum*, to expose the intolerance of the High Church party.

He was to receive no mercy, for the government had a long score to settle with him. On July 9 he was sentenced to stand three times in the pillory, to pay a considerable fine, and to remain in prison during the queen's pleasure. Between the passing of the sentence and its carrying out, he had written his intrepid *Hymn to the Pillory* in which he protested against the injustice of his judges, and he now had the mob on his side.

The writing of *The Shortest Way* was a turning point in Defoe's life. Robert Harley, still speaker of the Commons but soon to be one of the two secretaries of state, had kept his eye on Defoe as a man whose pen was likely to be useful to the government. Early in November, Harley obtained the queen's pardon for him, and from now on Defoe's fortunes were bound to Harley's. Defoe was in general agreement with Harley's moderate policy, and could usually support it with a clear conscience; but it would be misleading to suggest that he was never forced to write against his own convictions. The first unmistakable sign of a rejuvenated Defoe was the appearance, on Feb. 19, 1704, of the first issue of his famous *Review*. At first a weekly, it later appeared three times a week, and in this form (it died on July 11, 1713) Defoe carried it on singlehandedly, discussing the war with France, trade, politics, religion, and much else of interest. Meanwhile he also found time to pour out a steady stream of books, pamphlets, and poems. In *Giving Alms no Charity* (1704) he addressed himself to the problem of unemployment; in *The Consolidator*, a long prose satire, he mirrored contemporary English politics; and in *The Dyet of Poland* he pursued the same theme. To 1706 belongs his long political poem, *Jure Divino*, in which he set forth his views on government. Perhaps his finest journalistic achievement, however, was his *True Relation of the Apparition of one Mrs. Veal, the next Day after her Death, to one Mrs. Bargrave . . .* (1706), a contemporary ghost story which he had investigated.

Useful as Defoe's pen was to Harley, his writings formed only a part of his service. In the summer of 1704 Harley sent him into the country districts to report on the political situation. In September 1706 Harley dispatched him to Edinburgh on a still more important mission. Negotiations for the union between England and Scotland were now in progress, and Defoe's assignment was to send back reports on the attitude of the Scots, and to persuade them that the union was in their own best interests. When, in February 1708, Harley fell from power, Defoe honestly offered to stand by the fallen minister. However, Harley advised him to transfer his services to his colleague, Sidney Godolphin, and Defoe was not hard to persuade. Godolphin promptly sent him back to Edinburgh, and he made a third visit in 1709. A notable byproduct of his service in Scotland was his *History of the Union*, a folio of almost 700 pages, published in Edinburgh in 1709. In August 1710 Godolphin in his turn was dismissed and Harley was called back to office. The general election which followed in October brought the Tories to power, and almost at once they brought pressure to bear on the government to end the long and expensive war with France. Defoe, who had been supporting Godolphin and the war party in the *Review* and elsewhere, was forced to change his tactics, and although he maneuvered with his customary adroitness, he was bitterly attacked by the Whig journalists as a

turncoat. Early in 1713 he was in trouble for another ironical pamphlet, *Reasons against the Succession of the House of Hanover*, and again Harley had to intervene.

With the death of Queen Anne on Aug. 1, 1714, and the accession of George I, the Whigs swept back into power. But the irrepressible Defoe survived yet another shipwreck of his fortunes. Early in 1715 he had published a short defense of his political conduct during the previous reign—*An Appeal to Honour and Justice*—and now he made another adroit change of direction. Resourceful as ever, he made his peace secretly with the Whig leaders and, about 1717, found employment on the most virulent of the opposition newspapers, Nathaniel Mist's *Weekly Journal*, and undertook to take the sting out of it. When at last he quarreled with Mist, he continued to write for John Applebee's *Weekly Journal* and several other papers.

Of all that Defoe had written to this time, little is generally read today. It was only when he had more or less disentangled himself from politics and his own life had become comparatively uneventful that he began to write those stories of adventure for which he is now remembered. In April 1719, Defoe's 60th year, appeared the first and most famous of them, *Robinson Crusoe* (q.v.), followed some months later by a volume of *Further Adventures*. In 1719 also came *The King of Pirates*, and next year, *Memoirs of a Cavalier and Captain Singleton*. His *annus mirabilis*, however, is unquestionably 1722 which saw the publication of *Moll Flanders*, *A Journal of the Plague Year*, and *Colonel Jacque*. With *Roxana* (1724) and *A New Voyage round the World* (1725), Defoe's remarkable vein of fiction was at last worked out, unless we may include the *Memoirs of Captain Carleton* (1728) and *Robert Drury's Journal* (1729).

In all his works of fiction his method consists of realistic make-believe. He assumes the character of his leading protagonist (as he had done in *The Shortest Way*), and proceeds to describe in an autobiographical narrative a struggle for existence—on a desert island, in the streets of London, in the plantations, and elsewhere. Although the highly circumstantial detail is mainly concerned with the physical environment of the chief characters, Defoe is also interested in their thoughts and in their fluctuating reactions to temptation and economic necessity. Into those stories he brings much of his own personal experience, adapted to the circumstances by his ready invention, and he also draws freely on his wide reading in travel books, memoirs, and histories. His firm hold on fact is everywhere apparent.

Defoe was now turning out books and pamphlets faster than ever before. His preoccupation with conduct found expression in *The Family Instructor* (2 vols., 1715, 1718) and *Religious Courtship* (1722). His interest in the occult was evidenced in such books as *The Political History of the Devil* (1726), *A System of Magick* (1726), and *An Essay on the History and Reality of Apparitions* (1727). A lifelong concern with trade reappears in *The Complete English Tradesman* (2 vols. 1725, 1727) and *A Plan of the English Commerce* (1728); and he turned his travels in England and Scotland to good account in *A Tour Thro' the whole Island of Great Britain* (3 vols., 1724, 1725, 1727). In all probability he was writing up to the last days of his life, for he left an unpublished book on education, *The*

Compleat English Gentleman (ed. K. D. Bülbring, 1890).

In the summer of 1730, harassed by an old creditor and in failing health, he went into hiding. He died in April 1731 at a lodging-house in Ropemaker's Alley, and was buried in Bunhill Fields, "the Campo Santo of the Dissenters." Defoe was one of the first, and is still the greatest, of English journalists and, by virtue of *Robinson Crusoe*, one of the world authors of the English race.

Bibliography.—As the list of Defoe's writings extends to over 400 separate titles, it will be understood that only some of his most important works have been named above. The fullest bibliography is that compiled for *The Cambridge Bibliography of English Literature* (Cambridge, Eng., 1940) by H. C. Hutchins, who is also the author of *Robinson Crusoe and its Printing, 1719–1731* (New York 1925). It seems unlikely that a complete edition of the works will ever be undertaken. The fullest selection is to be found in the 20 volume edition published at Oxford, 1840–41. Three are three modern editions of the fiction: *Romances and Narratives*, ed. G. A. Aitken, 16 vols. (London 1895); *Works*, ed. G. H. Maynadier, 16 vols. (New York 1904); and *Novels and Selected Writings*, 14 vols. (Oxford 1927–28). *The Tour Thro' England and Wales* was reprinted with an introduction by G. D. H. Cole (London 1928) and in the same year for the *Everyman* library. A complete facsimile of the *Review* was edited for the American Facsimile Text Society by A. W. Secord, 22 vols. (New York 1938), and *An Index to Defoe's "Review"* compiled by W. L. Payne (New York 1948). An edition of Defoe's *Letters* by G. H. Healey (Oxford) was published in 1955.

Of earlier biographies, the best are Walter Wilson's in three volumes (London 1830), still useful for background material, and William Lee's *Life and Recently Discovered Writings* in three volumes (London 1869), volumes two and three containing newspaper contributions attributed by Lee to Defoe. More recent biographies are *The Life and Strange and Surprising Adventures of Daniel Defoe* by Paul Dottin (Paris 1924; New York 1929) and *Defoe* by James Sutherland (London 1937; 2d ed. 1950). Much of the best critical work is being done in the United States, notably A. W. Secord's *Studies in the Narrative Method of Defoe* (Urbana, Ill. 1924) and J. R. Moore's *Defoe in the Pillory and Other Studies* (Bloomington, Ind. 1939).

JAMES SUTHERLAND,
Lord Northcliffe Professor of Modern English Literature, University of London.

DE FONTAINE, Felix Gregory, American journalist: b. Boston, Mass., 1834; d. Columbia, S. C., Dec. 11, 1896. A reporter by profession, he founded his own newspaper, the *Daily South Carolinian*, in Columbia, S. C., and subsequently went to New York City to join the staff of the *Herald*. He is credited with having given the North the first statement on the attack on Fort Sumter, and he continued to report the highlights of the Civil War with journalistic accuracy. De Fontaine is the author of *The Cyclopaedia of the Best Thoughts of Charles Dickens* (1873), *Birds of a Feather Flock Together* (1878), a collection of E. H. Southern's memoirs, and *Army Letters of Personne* (1896).

DE FOREST, dē fōr'ēst, Lee, American inventor: b. Council Bluffs, Iowa, Aug. 26, 1873. In 1879 his father was asked to reorganize Talladega College, a normal school and college for Negroes in Talladega, Alabama. In this small community, young De Forest received his early education. In 1891 he was sent to Mt. Hermon Boys' School at Mt. Hermon, Mass., and he later entered Yale's Sheffield Scientific School, graduating in 1896 and receiving his Ph.D. in 1899.

Even at school he had realized that the old European spark coil with hammer interrupter was badly adapted as a sending device for wireless signaling. His remedy was an alternating-current generator with a step-up transformer to

supply a steady high (acoustic) frequency spark. Such a transmitter, or "responder," instead of the slow Marconi coherer, would permit wireless telegraphing almost as fast as that sent over a wire. De Forest's solution of this problem resulted in the new American system of wireless, and led to the founding, in 1902, of the American De Forest Wireless Telegraph Company. It was this system which was used for the first wireless press reporting in history—in the Russo-Japanese War, 1904.

The epoch-making electron tube, called the "Audion" by De Forest, was developed in 1906, but its potentialities were ridiculed in the early years of radio. In 1913 he was actually placed under arrest by a United States marshal and charged with using the mails to defraud by trying to sell stock to finance the invention. By 1952, however, it was estimated that the total value of radio, television, long-distance telephony, motion-picture, and electronic equipment, based on the audion tube, and the income derived therefrom, was about \$90 billion.

De Forest was a pioneer in the field of talking motion pictures, and his "Phonofilm" demonstration at the Rivoli Theatre in New York in 1923 marks the world's first theatrical presentation of sound-on-film motion pictures. From 1902 to 1952 he has held more than 300 patents, including, besides those on the inventions mentioned above, the cold-cautery or radio knife for use in surgery (1907), high-frequency oscillator (feedback) circuit (1910), radiotelephony (1919), radio signaling system (1922), radio receiving system (1923), communication system for trains (1924), loud speaking device (1925), photo-electric cell (1929), soundproofing picture camera (1933), television apparatus (1936), and color television. In 1954, Dr. De Forest was engaged in further electronic experiments in his laboratory in Los Angeles, Calif. His autobiography, *Father of Radio*, was published in Chicago in 1950.

DE FOREST, Robert Weeks, American lawyer: b. New York, N. Y., April 25, 1848; d. there, May 6, 1931. After graduating from Yale University in 1870, he studied law at Columbia University, being admitted to practice in 1871. In 1874 he became general counsel, and in 1902 vice president, of the New Jersey Central Railroad. Named chairman of the New York State Tenement House Commission in 1900, he became first New York City tenement house commissioner in 1902, serving until 1903, and in 1925 he was elected president of the Welfare Council of New York. De Forest was also a trustee (1889), secretary (1904), and president (1910) of the Metropolitan Museum of Art, and president, from 1888, of the Charity Society of New York City.

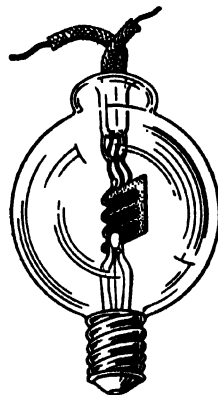
DE FOREST ELECTRON TUBE, an evacuated glass bulb containing a filament or cathode capable of emitting electrons when heated, an insulated metallic plate (anode) near the cathode, and a wire grid between the cathode and anode. The grid controls the passage of electrons from cathode to anode by varying the applied electrical potential.

The introduction of this grid, or third element, was Dr. Lee De Forest's great contribution. Without it the tube was a rectifier. The grid made it an amplifier of minute currents and a generator of low- or high-frequency currents.

Thomas A. Edison, experimenting in 1883 with carbon-filament incandescent lamps, observed that a tiny current flowed through the evacuated gas from a heated filament to a metal plate but not in the reverse direction. This was the first two-element thermionic tube, or "diode."

Edison was too absorbed with other work to pay more attention to it, but the investigation was pursued independently in Britain by Sir William Preece and Sir John Ambrose Fleming, and in Germany by (Johann) Wilhelm Hittorf, Julius Elster, and Hans Geitel. Sir Joseph John Thomson in 1899 determined that the negative charges escaping from the filament were electrons. Owen Williams Richardson in 1902 established the laws of thermionic emission and the flow of electrons in vacuum. Fleming discovered in 1904 that the tubes were capable of detecting wireless signals.

De Forest produced a sensitive two-element detector utilizing the "Edison effect" but adding a local battery and telephones in the plate circuit. He called it an "audion." In a patent application filed on Oct. 25, 1906, he introduced two plates within the tube, one connected to the antenna, the other to the telephones and battery. He thus



The original audion, invented by Lee De Forest and patented 1905.

separated the input from the output circuit and turned the device into a relay—the first "triode."

De Forest later inserted a grid between the filament and a single plate, probably in December 1906, and connected the grid to the antenna and the filament to the ground. In 1907 he demonstrated a radio telephone with grid audions on the yacht *Thelma* on Lake Erie.

De Forest's second great electron-tube invention came in 1912 when he discovered that the audion would oscillate when the input and output circuits were coupled together. Called the feedback circuit, or "vacuum tube oscillator," it replaced the arc, spark and alternator for generating high-frequency alternating currents.

Rights to De Forest's patents were acquired by the American Telephone and Telegraph Company in three transactions totaling \$390,000.

Other inventors contributed improvements, including the two-grid audion, or "tetrode," and the three-grid audion, or "pentode." These are the tubes that have come into general use.

Two long court contests were eventually won by De Forest in the United States Supreme Court. One was against Fleming who maintained that his two-element valve patent anticipated and dominated De Forest's patents. The other, over the

feedback oscillator, was with Edwin H. Armstrong.

The entire electronic industry—amounting to \$8,000,000,000 in 1953—is based on De Forest's inventions. More than 50,000,000 radio sets and 25,000,000 television sets in America use over half a billion electron tubes. The telephone system uses many millions. Electron tubes are employed in such diverse fields as mass production, automation, railroad and motor transportation, marine and aircraft navigation and communication, police protection, sound recording and reproduction, atomic-energy control, homes, elevators and kitchens. The growth is shown on the accompanying "tree," from *Electronics*, September 1952.

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DEFREGGER, dā-frěg'ēr **Franz von**, Austrian painter: b. Stronach, Tyrol, 1835; d. 1921. The son of a peasant, he early showed a talent for drawing and wood carving, which he practiced untutored while tending his father's cattle. His career began late, for he lacked instruction till, in 1860, he went to Innsbruck to study sculpture under Michael Stolz, who, discovering his greater talent for painting, sent him to Munich, where he studied at the academy under Anschütz. He later became a pupil of Piloty, to whose influence he is indebted for his technique. He soon found the sphere in which he was to score success—the delineation of Tyrolean everyday life and of many stirring episodes in the history of his native land.

DE GARMO, Charles, American educator: b. Mukwonago, Wis., Jan. 7, 1849; d. 1934. He graduated from the State Normal University of Illinois in 1873; was principal of public schools, Naples, Ill., 1873-76; professor of modern languages at the State Normal University 1886-90, and president of Swarthmore College 1891-98. From 1898 to 1914 he was professor of the science and art of education at Cornell University.

DEGAS, də-gā', **Hilaire Germain Edgar**, French painter and engraver: b. Paris, July 19, 1834; d. September 1917. He was a pupil of La Mothe and studied at the Beaux Arts in Paris. He was one of the most interesting members of the impressionist school, having worked in pastel, etching, dry point and stone engraving, producing numerous interiors of theaters and café concerts, foyers of the opera, views of the circus and of laundries, studies of dancers, etc., and all with a masterly touch. He expresses a modern ideal of energy and used a modern language for its expression. In order to say what he wanted he was obliged to master the human figure, and this he did with the thoroughness of the ancients. In pure draftsmanship he was unequalled. He also produced several portraits of Manet.

DE GASPERI, Alcide, Italian statesman: b. Trento (then an Austrian city) 1881. Educated

at Trento and the University of Vienna, he served in the Austrian parliament before World War I and in the Italian parliament after the Trentino had been united with Italy. One of the founders of the Christian Democrat party, he was an outspoken opponent of the Mussolinian dictatorship. In 1926 he was sentenced to ten years' imprisonment for anti-Fascist activities. Released through the intervention of his friend Archbishop Endrici, he worked in the Vatican Library until 1939, supplementing his meager income by translations and essay writing. In 1944 he was active in the underground movement against the German forces, and in this work his fluent knowledge of German, French and English was of great assistance. Appointed minister of foreign affairs in the Cabinet of Premier Ivanoe Bonomi in December 1944, he was reappointed to the same post in the succeeding Cabinet of Premier Ferruccio Parri in June 1945. On December 4 of the same year he was named premier by Lieutenant General of the Realm Crown Prince Umberto, but retained the foreign ministry in the six-party Cabinet which he formed comprising Communists, Socialists, Christian Democrats, Actionists, Labor Democrats and Liberals. The referendum of June 2, 1946 which resulted in abolition of the monarchy and establishment of the republic made Dr. De Gasperi automatically provisional head of state until June 28 when the Constituent Assembly elected Enrico De Nicola provisional president. On July 1 he resigned the premiership, but two weeks later was reappointed premier in the first republican government. He held this post until July 28, 1953. In the national elections of April 1948, his party had a majority after a struggle which brought out a record vote. In 1950 he was again confirmed in power, with a new cabinet, but in 1953, when the first elections since 1948 were held, his margin was very small. After 13 days of a one party Christian Democrat cabinet, he resigned on July 28 following a vote of no confidence by the Chamber of Deputies.

DE GAULLE, Charles, French soldier, head of the French Committee of National Liberation and the provisional French government: b. Lille, France, Nov. 22, 1890. His father was a professor who taught philosophy and French literature at the Jesuit College in Paris. Entering Saint-Cyr in 1908, he was graduated with honors in 1911, and joined the 33d Infantry, then commanded by Colonel Pétain. Twice wounded during the early years of World War I, he was wounded a third time and captured at Fort Douaumont in March 1916. His five attempts to escape from prison camps failed due to his exceptional height (he is the tallest officer in the French Army). After serving on Weygand's staff in the Polish campaign of 1920-1921 he became professor of military history at Saint-Cyr while still a captain. Appointed aide-de-camp to Marshal Pétain after studying at the Ecole de Guerre, he remained with the marshal until 1927 when the latter retired from supreme command of the army, having reached the age limit. During the "long armistice" de Gaulle's iconoclastic writings attracted considerable attention in high military circles. His books include *Dissension Among Our Enemies* (1924), *At the Sword's Edge* (1932), and *The Army of the Future* (1934), his magnum opus which, with its

revolutionary ideas of army mechanization, attracted Paul Reynaud's attention and initiated the friendship between the two men. The German General Guderian based his Panzer division organization on de Gaulle's concepts. In two actions at Laon and Abbeville during the May 1940 operations, de Gaulle, commanding a poorly equipped and hastily trained mechanized division, defeated the Germans, and thereby gave ultimate proof of the validity of his mechanization thesis. By this time he had attained the rank of major general.

General de Gaulle's rise to political power dates from his appointment as under-secretary of war in Reynaud's cabinet early in June 1940. He flew to London on June 8 and 16 for hasty conferences with Winston Churchill and Anthony Eden. He returned there a third time on June 20, after the Pétain government's request for an armistice, and that evening initiated the Free French (later Fighting French) movement by his memorable radio proclamation of France's invincibility coupled with an appeal to the French people to stand firm and realize that "the Battle of France has begun." As a symbol of France's refusal to accept defeat, de Gaulle obtained recognition for his new government which functioned first in London and then in Algiers, pending its removal to liberated Paris in August 1944. After serving as president of the Provisional Government of France from September 1944, he was unanimously confirmed in this position by the National Assembly on Nov. 13, 1945; but on Jan. 20, 1946, he resigned in protest at the Communist-Socialist policy. Subsequently de Gaulle headed a movement in France to establish a strong presidency as a check on the power of the legislature.

DE GEER, dē-yār', Gerhard Jakob, Swedish geologist and geographer: b. Stockholm, Sweden, Oct. 2, 1858; d. there, July 23, 1943. Professor of geology at the University of Stockholm, De Geer made important contributions to the study of glaciation, and founded and directed the university's Geochronological Institute. From his investigations of the banded sand and clay deposits, called *varves*, in the glacial region of the Baltic, he worked out a system of dating recent geological events by showing the exact location of a retreating ice sheet through the years. He wrote numerous monographs on the subject, among which are *On the Physical Explanation of the Ice Age* (1935); and *Geochronologia succica* (1940).

DE GEER, BARON Louis Gerhard, Swedish statesman and writer: b. Östergötland, Sweden, July 18, 1818; d. Hanaskog, Sept. 24, 1896. He entered the Riksdag (Parliament) in 1851, and in 1855 served as president of the Göta Hofret, a Swedish supreme court. In 1858 he was appointed minister of justice, which office he held until 1870 and again for a short term from 1875 to 1876. In this capacity he introduced a new parliamentary organization by replacing the old system of representation by states with a bicameral elective Parliament. Accepted by the Riksdag in December 1865, this new order was sanctioned by the king in the next year. He was also responsible for improving the legal status of single women and liberalizing the Swedish penal code.

De Geer became minister of state in 1876 but

resigned three years later after the failure of his efforts to solve the armaments question. Thereafter he served as chancellor of the universities of Uppsala and Lund (1881-1888). His writings include novels, aesthetic essays, political memoirs, and his autobiography *Minnen* (1892), which presents a valuable picture of the history of his times.

DEGENERATION, dē-jěn-ēr-ā'shūn, a term denoting the loss of essential qualities in objects or organisms by the process of growing simpler. In many usages there is also the connotation of growing worse, of the substitution of a lower for a higher form, or of deterioration. The various usages of the word are not always entirely consistent with each other.

Mathematics and Physics.—Here the word means merely the loss of some characteristic or distinctive property, usually leading to greater simplicity. Consider the geometric curves—ellipse, parabola, and hyperbola—which are called conic sections, since the Greeks discovered that they are plane sections of a right circular cone. If the vertex of the cone is removed to an indefinite distance, the cone approaches more and more closely to a cylinder, and sections of it, in a plane parallel to the axis, reduce to two straight lines, a single line, or nothing. These are termed degenerate conic sections. When one of the rectangular arrays of quantities, which is called in mathematics a matrix, has no reciprocal, it is said to be degenerate. When in certain physical problems two fundamental variables are found to be the same, the system is said to be degenerate.

Biology.—The term is used in biology to describe cases in which the adult stages of an organism are simpler than its younger stages, or cases where one or more of the organs of the younger stages become simpler or disappear as the organism becomes adult. Thus many parasitic worms and crustaceans are much simpler than their larval stages, and may be incapable of independent motion whereas the larvae were free-swimming. The sessile adult ascidian shows only traces of the chordate characters of the embryo. Examples of the degeneration of individual organs are the disappearance of the tail of a tadpole as it becomes a frog, and the loss of the digestive system in the mature mayfly. In the case of parasites, this degeneration and simplification is associated with the dependency of the adult, which loses its need for many specialized structures. At the same time considerable chemical specialization, in the form of special enzymes and antienzymes necessary for survival in the host, may have taken place, so greater simplification is sometimes only apparent.

Evolution.—The general course of evolution is in the direction of greater complexity, but simplification may also result. According to Williston's law, "The parts in an organism tend towards reduction in number, with the fewer parts greatly specialized in function." An example of this is found in the multiple legs of the earliest crustaceans (trilobites), all of which were used for locomotion, and the many fewer legs of a modern crab, some used for locomotion and some for grasping. It is evident that in the course of evolution many of the legs of the trilobite have degenerated and disappeared, yet the process as a whole exhibits increasing complexity as well as increasing simplification. The

single toe of the horse, which evolved from the four-toed *Eohippus*, is another example of this process.

Other examples of degeneration in evolution are the loss of the hind pair of limbs by whales, and of both pairs of limbs by snakes. Examples of structures which manifest the same tendencies in man are the vermiform appendix and the wisdom teeth.

It is an empirical generalization of evolution that degenerating structures are much more variable than structures which retain full function. The degeneration of useless organs is thought to be due to the accumulation of mutations (abrupt inherited changes) which are generally deleterious, and throw the delicate mechanism of adaptation out of adjustment. Also, genes which have a favorable effect on some of the useful organs may have an unfavorable effect on the vestigial organ. There will be no positive selection pressure acting on a useless organ to eliminate these unfavorable effects, and the organ will therefore degenerate. In other cases, as in the case of the hind limbs of whales, degeneration may be speeded up by positive selection, as the presence of these organs externally is a disadvantage, and greater "streamlining" results from their disappearance.

A striking example of degeneration, or *regressive evolution* as many prefer to call it, is the blind depigmented cave fish (*Caecobarbus geertsii*, the African barb), which has no eyes, only thin scales, and lacks melanin and most of the other usual skin pigments. In addition to the accumulation of mutations, it has been suggested that in the case of the cave fish the altered characteristics are largely due to a lower rate of growth, resulting from a lower basal metabolism. Lower metabolic rate would be an advantage under conditions where the food supply was meager.

Pathology.—The group of processes known as degenerations in pathology is rather heterogeneous. They may be considered as signs of sickness of the cells of the organs involved. A description of some of these processes is given below.

Cloudy swelling, the commonest of the degenerations, affects chiefly the kidney, the liver, and the heart muscle. The organ is slightly enlarged, because of swelling of the constituent cells. It is also pale, and the cut surface has a cloudy appearance, as if scalded by hot water. The swelling and granularity of the cells obscures the characteristic outlines of the microscopic structures.

Fatty degeneration is a degeneration of the cells, accompanied by the appearance of fat droplets in the cell material. The fat may be demonstrated by staining with osmic acid. Two important causes of fatty degeneration are the action of toxins and lack of oxygen. Inorganic poisons such as phosphorus and specific nutritional deficiencies may also produce fatty degeneration.

Lipoidal degeneration is a set of pathological changes involving chiefly cholesterol and cholesterol ester. Cholesterol is not a true fat but a complex alcohol. Cholesterol crystals may be found in caseous tissue, degenerating goiters, dermoid cysts, and elsewhere. The yellow patches on the inner surface of the aorta in atherosclerosis consist mainly of cholesterol and cholesterol ester, but neutral fat is also present.

Amyloid degeneration is now relatively uncommon. It differs fundamentally from fatty degeneration in that it affects connective-tissue fibers and not primarily the parenchymatous cells (functional cells containing little or no supporting material) of an organ. The name amyloid is very misleading. It was suggested by the German pathologist, Rudolf Virchow, who thought the resistant transparent substance seen in the cells was a carbohydrate related to starch, because it gives a blue color when treated with iodine followed by sulphuric acid. It is now known to be a mucoprotein (a type of protein containing chondroitin sulphuric acid), which is ordinarily found in connective tissue.

Amyloid degeneration occurs in chronic wasting diseases such as tuberculosis, long-continued suppuration of bones and joints, and syphilitic lesions. It has sometimes been produced by injection of bacterial toxins. Amyloid degeneration is rarely confined to a single organ.

Hyaline degeneration is different from fatty and amyloid degeneration because it includes many different substances which are translucent (hyaline) and which stain brightly with acid dyes such as fuchsin. Connective hyaline tissue appears as a homogeneous swelling of collagen and the walls of blood vessels in arteriosclerosis. In chronic nephritis the renal glomeruli become converted into hyaline masses. The islets of Langerhans in the pancreas may become converted into a hyaline mass in diabetes, but on the other hand the diabetic pancreas often looks perfectly normal.

Mental Pathology.—Certain individuals inherit genes which predispose an inadequate development of certain mental qualities. Such individuals used to be called degenerates, but the term defective is more appropriate. In man, cases the basis of the defect seems to be a lesion of the nervous system. The neurosensory defects are often accompanied by physical or metabolic disorders known as stigmata. In a rare disease known as phenylketonuria or phenylpyruvic oligophrenia the inability of the patient's metabolism to convert the amino acid phenylalanine to tyrosine is associated with imbecility or idiocy. Another inherited defect, amaurotic idiocy, is characterized by a progressive degeneration of the central nervous system, leading to impairment of vision, progressive muscular weakness, epileptiform convulsions (in many cases), and gradual emaciation. Post-mortem demonstrates widespread and characteristic changes in the nerve cell bodies throughout the central nervous system, including the spinal root ganglia.

Many of these degenerative nervous diseases are hereditary, and it is common to find that consanguineous marriages are prevalent among the parents of defectives. This illustrates the bad effects of inbreeding in stocks containing undesirable recessive genes. Some degenerative conditions are not hereditary, but are the result of intrauterine damage during fetal life, sometimes following a virus infection of the mother during pregnancy, as in the case of German measles.

The term degenerate was formerly applied to persistent delinquents who appeared to possess normal intelligence, but this usage has been largely abandoned. It has also been applied to those individuals who fail to develop the sense of moral values demanded by our particular culture. Sigmund Freud, however, has called such cases examples of arrested development. Freud

points out that at one time it was customary to designate all morbid manifestations which were not obviously of traumatic or infectious origin as degenerative. He was of the opinion that the term had been used so indiscriminately that it was no longer of any value in speaking of mental disorders, and in particular he did not believe that sexual perverts were degenerates. The term used by the cultural anthropologist for individuals who do not possess the moral standards characteristic of their particular culture is "cultural deviate."

Some states of the United States, in an attempt to prevent the transmission of inherited mental defect, have passed laws making it legal in certain cases to perform sterilization operations on mental defectives or "degenerates." In some states the laws apply also to certain types of criminals such as sex offenders.

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WILLIAM C. BOYD,
School of Medicine, Department of Biochemistry,
Boston University.

DEGER, dā'gēr, Ernst, German painter: b. Bockenem, Hannover, Germany, April 15, 1809; d. Düsseldorf, Jan. 27, 1885. A student of Karl Wilhelm Wach in Berlin and Wilhelm von Schadow in Düsseldorf, Deger devoted his life to religious art. After studying 15th century Florentine painting in Italy (1837–1843), he began his notable frescoes depicting the life of Christ in the church of St. Apollonaris in Remagen. Completed in 1851, these frescoes represented the art of the Nazarenes in Germany at its height. In 1851 he began a series of redemption scenes for the chapel of the castle of Stolzenfels in Coblenz, after the completion of which he settled in Düsseldorf, where, in 1869, he was made professor in the Academy of Fine Arts.

DEGGENDORF, dā'gēn-dōrf, city, Germany, in Lower Bavaria, about 30 miles northwest of Passau on the Danube River. Situated in the American Zone, it contains a large displaced persons camp and several old buildings and churches, among which the Church of the Holy Sepulchre, begun in 1337, is known as a place of pilgrimage. The famous Bavarian Forest region nearby draws many tourists and excursionists to the city. Its industries include metal working, brewing, and the manufacture of chemicals, textiles, and cement. Cattle, grain, and lumber are marketed and granite is quarried nearby. Deggenndorf was first mentioned in 868 and its charter dates from about 1311. Pop. (1950) 16,328.

DEGOUTTE, dē-gōōt' Jean Marie Joseph, French general: b. Charnay, Department of the

Rhône, France, April 18, 1866; d. there, Oct. 31, 1938. Educated at l'École Speciale Militaire in St.-Cyr-l'École and at l'École Supérieure de Guerre in Paris, he served in the Boxer campaign and in various colonial posts before the outbreak of World War I, in the course of which he was rapidly promoted in rank. In 1918 he commanded the French 4th Army, which had been reinforced by three American divisions, and, from the end of the war to 1925, the French forces on the Rhine. He was appointed to the superior war council in 1920. From 1923 to 1925 he was in command of the French forces of occupation in the Ruhr district in Germany. Opposed to the occupation, he nevertheless acted on government orders which he enforced to the extent of court-martialing ten Ruhr industrialists and fining them heavily.

DEGRADATION, dēg-rā-dā'shūn, in the Catholic Church, a penalty inflicted on clerics found guilty of criminal acts. This penalty deprives the offender of all order, benefice, and clerical privilege conferred upon ordination, but does not take away the character thus conferred, nor does it exempt him from the law of celibacy and the recitation of the breviary. Degradation has two parts: *verbal*, the sentence, and *real* or *actual*, the execution of that sentence; neither, however, is distinct in itself.

The Ceremony.—The ceremony of actual degradation reduces the culprit to the status of layman and then releases him to the secular court. He is first attired in the vestments of his order and rank, and brought before his ecclesiastical superior. By a decision of the Council of Trent, the degradation of a priest before a bishop must take place in the presence of six mitred abbots sitting as associate judges, and in the case of a deacon or subdeacon, in the presence of three similar prelates. In the absence of abbots, mature church dignitaries skilled in canon law may be substituted. The votes of these judges are decisive and the judgment must be unanimous. The cleric thus found guilty is then gradually divested of all symbols of his ecclesiastical profession and his head shaven to obliterate the mark of clerical tonsure. Upon his being turned over to the lay judge (whose presence is required), a plea is made for leniency and the avoidance of bloodshed.

History.—Degradation as a canonical punishment was adapted by the church from the similar practice used in the army to expel criminal personnel. It is first mentioned in the 83d Novel of Justinian and was used effectively against heretics by early medieval councils. Degradation was originally the same punishment as deposition (q.v.), by which an offender retained his ecclesiastical privilege and remained under church jurisdiction. But Pope Innocent III (1198–1216) distinguished it by issuing a permanent rule requiring the offender to be stripped of all privilege and to be turned over to lay authorities. Rarely used in modern times, degradation has been replaced by dismissal with perpetual deprivation.

DE GRASSE, COMTE. See GRASSE, COMTE FRANÇOIS JOSEPH PAUL DE, MARQUIS DE GRASSE-TILLY.

DEGREE. A title given by a university or college to those who have completed a more or less definitely prescribed course of

study. While educational institutions corresponding to our universities existed in ancient times, and while these undoubtedly gave to those who had completed a course of study some marks or title of distinction, the present academic degrees do not go back continuously further than the Middle Ages. As the titles doctor and master show, they were originally nothing more nor less than licenses to teach. They were also perfect synonyms; and it was only after some centuries of varying usage that the English universities came to appropriate the title of doctor to the higher faculties of theology, canon law and medicine, and the title master to the lower faculties of grammar and arts. The title of doctor was often applied to distinguished scholars, together with some laudatory epithet: thus Duns Scotus was known as the "Subtle Doctor," and Thomas Aquinas as the "Angelical Doctor." The degree was also sometimes conferred honorarily by the Pope or the Emperor, and those who received it in this manner were known as *doctores bullati*. Those who received their degree in course, the *doctores rite promoti*, had to prepare a thesis in Latin, read it in public and defend it against a doctor of their faculty, other selected adversaries, and in general against all comers. This custom survived in its original form in England until the middle of the last century. In Germany and America, though the doctoral dissertation is not read in public, the examination to which each candidate must submit consists in a large measure of a defense of his thesis against the members of his faculty or department.

The title of bachelor was not a degree at the time of its first appearance in the 13th century but merely indicated that its possessor had fulfilled certain preliminary requirements for the degree of doctor or master. As the mediæval courses varied from 4 years in arts to 14 in theology, the importance of the preliminary title varied much between the different faculties. In the higher faculties, and eventually in arts, it took on the significance of a degree, except in France, where to the present day it represents merely the completion of a secondary education. Another preliminary degree which gave the right to teach was the *Licentiate*, so called from the *licentia docendi*. The licentiate stood between the baccalaureate and the doctorate.

In England the bachelor's degree is usually the first to be conferred, after a course of three years. The courses for the ordinary or pass degree and the honors degree, which is subdivided into three or four classes or levels of merit, are different, and each may be taken in several different subjects (schools at Oxford, triposes at Cambridge). There are special bachelor's degrees for those from other institutions, and in law and some other faculties. The master's degree in arts is generally conferred without further examination upon the passage of a certain term of years and the payment of certain fees. The various doctor's degrees are generally either honorary, or are only given upon the production of mature scholarly works of real value. The German and American schemes, however, have been adopted by some of the newer universities. The University of London and some other institutions confer degrees by examination upon

those not in residence. The British universities outside of England follow in general the English scheme, except in Canada, where the American system of degrees has had more or less influence, and in Scotland, where there is a different established tradition. In Scotland the master's degree in arts is not preceded by a baccalaureate. The German universities give no other degree than that of doctor except in the faculty of theology, where there is also the degree of licentiate.

The vast majority of the students at a German university take the degree under the faculty of philosophy, and indeed this is a necessary preliminary to the degree under certain other faculties. The doctor's degree is given after the presentation of a thesis and examination, and is divided into four grades of excellence: *rite*, *cum laude*, *magna cum laude*, and *summa cum laude*. The title of *privatdozent* may almost be regarded as a degree: it gives its possessor the *venia legendi*, or right of lecturing — collecting his own fees — at any German university. To acquire this right, a so-called *Habilitationschrift* must be prepared and accepted. The German system of degree prevails to a greater or less extent throughout the Continent, though in most cases the degree of licentiate or master are also given.

The French degrees are divided into those given by the state and those given by the university. The former consist of the several licentiates and doctorates, for the latter of which one or more dissertations are necessary. The latter consists of the doctorates of the university, which in general resemble the state doctorates.

In America, the older British system has been overlaid by the German plan, so that both master of arts and doctor of philosophy are given. The college course of four years, prescribed to a greater or less extent according to the university or college at which it is given, leads up to a bachelor's degree, usually in arts, science or philosophy, according to the amount of attention devoted to the classics and the natural sciences. These are given in most colleges and universities in four grades, of which the three higher are *cum laude*, *magna cum laude*, and *summa cum laude*. The various technical and professional schools, which may or may not require a college degree or a certain amount of college work for admission, give a bachelor's degree, except in the case of medicine and dental medicine, where the first degree is usually that of doctor. The master's degree is given upon the completion with credit of a year or two of post-graduate work, with or without the writing of a thesis. The doctorate in philosophy and science, and occasionally in theology and law, is given much after the German fashion, upon from two to five years of post-graduate work, the writing of a thesis and the satisfactory passing of written and oral examinations. For the most part the degree of doctor of letters (Litt.D.), doctor of laws (LL.D.) and doctor of divinity (D.D.) are conferred as honorary degrees. This practice of conferring honorary degrees has in many cases been grossly abused, and even the ordinary degrees given in course have been put to the entirely unnatural use of compliments or gifts.

The more familiar degrees are usually known by the following abbreviations.

A.A.	Associate in Art.
A.B. or B.A.	Bachelor of Arts.
A.M. or M.A.	Master of Arts.
B.C.L.	Bachelor of Civil Law.
B.D.	Bachelor of Divinity.
B.Litt., B.L., or L.B.	Bachelor of Letters.
B.L., B.L.L., or L.L.B. (<i>Legum Baccalaureus</i>)	Bachelor of Laws.
B.P., B.Phil., or Ph.B.	Bachelor of Philosophy.
B.S. or B.Sc.	Bachelor of Science.
C.E.	Civil Engineer.
C.M. or Ch.M. (<i>Chirurgiae Magister</i>)	Master of Surgery.
Ch.E.	Chemical Engineer.
D.C.L.	Doctor of Civil Law.
D.D. or S.T.D. (<i>Sanctae Theologiae Doctor</i>)	Doctor of Divinity.
D.Litt. or Litt.D. (<i>Litterarum Doctor</i>)	Doctor of Letters.
D.M. or M.D.	Doctor of Medicine.
D.M.D. (<i>Dentariae Medicinae Doctor</i>)	Doctor of Dental Medicine.
D.V.M.	Doctor of Veterinary Medicine.
D.S., D.Sc., S.D., or Sc.D.	Doctor of Science.
E.E.	Electrical Engineer.
J.D. (<i>Juris Doctor</i>)	Doctor of Law.
J.U.D. (<i>Juris Utriusque Doctor</i>)	Doctor of Civil and Canon Law.
L.H.D. (<i>Litterarum Humaniorum Doctor</i>)	Doctor of Humanities.
LL.B. (<i>Legum Baccalaureus</i>)	Bachelor of Laws.
L.L.D. (<i>Legum Doctor</i>)	Doctor of Laws.
L.L.M. (<i>Legum Magister</i>)	Master of Laws.
Litt.B. (<i>Litterarum Baccalaureus</i>)	Bachelor of Letters.
Litt.D. (<i>Litterarum Doctor</i>)	Doctor of Letters.
M.B. (<i>Medicinae Baccalaureus</i>)	Bachelor of Medicine.
M.C.E.	Master of Civil Engineering.
M.D. (<i>Medicinae Doctor</i>)	Doctor of Medicine.
M.M.E.	Master of Mining Engineering.
Mus.B.	Bachelor of Music.
Mus.D.	Doctor of Music.
Ph.D. (<i>Philosophiae Doctor</i>)	Doctor of Philosophy.
Ph.G.	Graduate in Pharmacy.
S.T.B. (<i>Sacrae Theologiae Baccalaureus</i> or <i>Scientiae Theologiae Baccalaureus</i>)	Bachelor of Sacred Theology or Bachelor of Theology.
S.T.D. (<i>Sacrae Theologiae Doctor</i> or <i>Scientiae Theologiae Doctor</i>)	Doctor of Sacred Theology or Doctor of Theology.
V.S.	Veterinary Surgeon.

See COSTUME, ACADEMIC; DOCTOR; MASTER OF ARTS; UNIVERSITY.

DEGREES, Measurement of. After the general acceptance of the shape of the earth as essentially that of a sphere, many attempts were made by astronomical methods to measure the length of a degree of arc of the earth's surface. Especially noteworthy among early investigations was the work of Picard in France begun in 1669. The results, based on the method of triangulation, were utilized by Sir Isaac Newton in his calculations to prove that the gravity of the earth also controlled the motions of the moon. A further inference from Newton's extended work was that on the basis of the mechanics of rotation the earth should, in fact, be a spheroid and not a sphere.

Newton reasoned that the diameter of the earth at the equator should be greater than the diameter through the poles by $\frac{1}{230}$ part. This prediction led to extensive investigations in measuring the length of degrees along great circles on the surface of the earth. In this, the French played an important part. Early results actually made the length of a degree decrease from the

equator to the poles instead of increasing as should be the case if the earth were slightly flattened as predicted by Newton.

We now know that the methods then used did not allow for varying deflections of the plumb line caused by peculiarities in the local topography at the points where observations were made. Thus, for some 40 years, disputes were maintained over the question of whether the earth's polar diameter was actually longer or shorter than the diameter at the equator. To settle this dispute, the Royal Academy of Sciences in Paris organized two geodetic expeditions, one to remeasure the length of a degree of arc far north in Lapland, and the other to measure the length of a degree near the equator in Peru. The results of these two expeditions showed that the northern degree was actually greater in length than the degree measured at the earth's equator, thus vindicating Newton's prediction.

Further work was necessary however to settle the question as to just how much the flattening of the earth really was. The theory stated this to be $\frac{1}{230}$ part assuming that the earth had been in a perfectly liquid state when initially rotating. Calculations however always gave different results varying according to the different measurements adopted as their basis. Measurements were made not only in the Americas and Lapland, but also in France, England, Hungary, Italy, Sweden and India. Combinations of the results obtained in Lapland with the measurements in France gave for the flattening 1 part in 178. Combining measurements made in Peru with the length of the measured arc in Lapland, the flattening came out to but 1 part in 213. Combining the French and Peruvian observations gave 1 part in 304.

It is now known that much of the cause of these discrepancies was due to what has since been discovered as a lack of homogeneity in the earth's crust causing deflections in the vertical especially in mountainous regions. Measurements of meridional arcs began to increase rapidly and the more accurate observations were used in determining the ellipsoid of the earth as established by Clarke in 1866 and 1880.

Under the auspices of the International Geodetic Association, calculations were continued and by making allowances for the deflections of the vertical, reconciliation of divergent values obtained in various parts of the earth became apparent as these corrections were introduced. Later calculations of the shape of the earth made by Hayford were based chiefly on observations made in the continental United States. Hayford allowed for deflections of the vertical and introduced corrections for topography and isostatic compensation. His results best satisfied the observations available, and the Section of Geodesy of the International Geodetic and Geographical Union decided in 1924 to adopt the Hayford ellipsoid as established in 1909 as the future basis of international reference.

Heiskanen subsequently showed that European observations were in excellent agreement with Hayford's dimensions and that the amount of flattening at the poles was 1 part in 297.

Measurement of a Degree of Longitude.—Measurements of degrees of longitude are dependent upon the determination of time at two different meridians whose difference of longitude is to be determined. Two places differing by 15 degrees in longitude have a time difference of exactly one hour, since 15 degrees is $\frac{1}{24}$ of a

complete rotation of the earth. The accuracy with which degrees of longitude can be measured depends upon the accuracy with which time can be determined astronomically at the meridians concerned. An uncertainty of one second of time introduces an error of 15 seconds of arc in the resulting measurement. By modern astronomical methods time determinations can be made with an accuracy of about $\frac{1}{100}$ of a second. The resulting uncertainty in longitude difference at the equator is 0".15 arc. This corresponds to a linear distance of about 15 feet.

In the modern measurement of arcs of longitude, time at one meridian is determined by astronomical observations and comparisons made by radio communications with some standard meridian where time is similarly determined. Uncertainty in the result of longitude determinations involves proper allowances for the time of transmission of the radio wave which appears to vary with the location of the arc upon the earth's surface. The results of longitude campaigns have shown evidence that radio waves travel with a velocity approximating the velocity of light at the equator but with a velocity somewhat less than the velocity of light over arcs at higher latitudes.

Propagation time of radio time signals may be modified by disturbances in the ionosphere from which the radio time signal waves are reflected. Thus, further accuracy in the measurement of degrees of longitude awaits both increased precision in clocks, such as the new atomic clock, and in further knowledge of the vagaries of radio wave propagation through the atmosphere.

It is obvious that the linear distance between meridians at different latitudes will vary widely in the number of miles for one degree. At the equator a degree of longitude is 69.07 statute miles in length. At a latitude of 60 degrees, the length of a degree longitude is only one half this, while at the poles, the points of intersection of all meridians, the length of a degree of longitude is zero.

Latitude	Degree Longitude statute miles	Latitude	Degree Longitude statute miles	Latitude	Degree Longitude statute miles
0°	69.07	31	59.13	61	33.45
1	69.06	32	58.51	62	32.40
2	69.03	33	57.87	63	31.33
3	68.97	34	57.20	64	30.24
4	68.90	35	56.51	65	29.15
5	68.81	36	55.81	66	28.06
6	68.62	37	55.10	67	26.96
7	68.48	38	54.37	68	25.85
8	68.31	39	53.62	69	24.73
9	68.15	40	52.85	70	23.60
10	67.95	41	52.07	71	22.47
11	67.73	42	51.27	72	21.32
12	67.48	43	50.46	73	20.17
13	67.21	44	49.63	74	19.02
14	66.95	45	48.78	75	17.86
15	66.65	46	47.93	76	16.70
16	66.31	47	47.06	77	15.52
17	65.98	48	46.16	78	14.35
18	65.62	49	45.26	79	13.17
19	65.24	50	44.35	80	11.98
20	64.84	51	43.42	81	10.79
21	64.42	52	42.48	82	9.59
22	63.97	53	41.53	83	8.41
23	63.51	54	40.56	84	7.21
24	63.03	55	39.58	85	6.00
25	62.53	56	38.58	86	4.81
26	62.02	57	37.58	87	3.61
27	61.48	58	36.57	88	2.41
28	60.93	59	35.54	89	1.21
29	60.35	60	34.50	90	0.00
30	59.75				

A table showing the length in statute miles of each degree of longitude for varying degrees of latitude is appended, the calculations in this case being based on the assumption that the earth is a perfect sphere. More precise values for the length of a degree of longitude based upon the accepted Hayford ellipsoid may be calculated from the formula:

$$1^\circ (\text{statute miles}) = 69.2316 \cos \varphi - 0.0584 \cos^3 \varphi + 0.0001 \cos^5 \varphi$$

where φ is the latitude for which the length of a degree of longitude is desired.

DEGREES OF LATITUDE AND LONGITUDE. Degree of latitude is the space or distance on the meridian through which an observer must move to vary his latitude by one degree, or to increase or diminish the distance of a star from the zenith by one degree; and which, on the supposition of the perfect sphericity of the earth, is the 360th part of the meridian.

Degree of longitude is the space between the two meridians that make an angle of one degree with each other at the poles, the quantity or length of which is variable according to the latitude. See LATITUDE; LONGITUDE.

DE HAAS, de has, Maurice Frederick Hendrik, Dutch-American marine painter. b. Rotterdam, Dec. 12, 1832; d. Nov. 23, 1895. He studied in England and at The Hague under Louis Meyer, and in 1857 was appointed painter to the Dutch navy. In 1858 he came to the United States and opened a studio in New York which remained his home henceforth. Among his paintings are *Farragut Passing the Forts; Coast of France; Sunset at Sea; Moonlight at Sea; Sunset at Pigeon Cove; Sunrise in a Bay at Newport; Shipwreck, Menhaden Boats off Long Island; and Off Marblehead*. His brother WILLIAM FREDERICK was also a well-known marine painter: b. 1830; d. 1880. He settled in New York in 1854. Among his pictures are *Evening at Halifax; Narragansett Pier; Sunrise on the Susquehanna*.

DEHMEL, da'mēl, Richard, German lyric poet: b. Wendisch-Hermsdorf (Brandenburg), Nov. 18, 1863; d. Blankenese near Hamburg, Feb. 8, 1920. A forester's son, Dehmel first went to local schools, and in 1882 attended the university—chiefly at Berlin—where he devoted himself to philosophy and the sociological and natural sciences. Between 1887 and 1895 he was secretary of the Association of German Fire Insurance Companies and during this period completed a thesis for Leipzig which dealt with the insurance business. He also published his first books of poetry: *Erlösungen* (1891), *Aber die Liebe* (1893) and *Lebensblätter* (1895). In 1895 he resigned his insurance position and moved to Pankow, near Berlin, where he wrote: *Weib und Welt*, poems and fairy tales (1896); *Der Mitmensch*, tragi-comedy (1895); *Lucifer*, pantomimic drama (1899); and the children's book *Fitze-butze* (1900; 15th ed., 1910), which he wrote in connection with his first wife, Paula Dehmel, from whom he separated in 1899.

In his earlier writings Dehmel was influenced by Heine and Schiller, later by Liliencron, Strindberg, and Nietzsche. His works stress the importance of the feelings but also recognize their interaction with the intellect. His poems are

finished in form and represent diverse metrical schemes.

DEHRA DUN, dā-rā dōn, city, India, capital of Dehra Dun District in northern Uttar Pradesh. It is 37 miles northeast of Saharanpur at the end of a rail line. Tea, grain, oilseeds, and other agricultural products of the surrounding area are processed here. The district is also noted for its timber, and the city has the Forest Research Institute which grew out of a school established in 1867. The Indian Military Academy established here in 1932 was expanded in 1949 and reorganized as the Armed Forces Academy. The city was founded in the 17th century by Ram Rai, a Sikh religious leader. Pop. (1951) 144,216.

DEHYDRATION, Food. See **FOOD PRESERVATION—Dehydration.**

DEHYDROCHOLIC ACID, dē-hi-drō-kō'lik, $C_{26}H_{44}(CO)_2CO_2H$, a derivative of cholic acid. It is a colorless crystalline powder used to promote the flow of bile into the intestines, particularly when there has been contraction of the gall bladder. Its sodium salt in a 20 per cent solution is employed along with radio-opaque substances in the visualization of the gall bladder by means of X-rays. The trade name of this substance is Decholin.

DEI GRATIA, dē'i grā'shī-ā (Lat. "by the grace of God"), a formula which is taken from an expression of the Apostle Paul in the New Testament (I Corinthians 15:10). It has been used since the 5th century when it was added to some of the signatures at the Council of Ephesus (431) indicating dependence upon the grace of God, and it was prevalent among the clergy by the 11th century. The additional words "et Apostolicae Sedis Gratia" ("and the Apostolic See") became current in the 11th century and were prevalent by the 12th and 13th centuries. Secular princes later began to use the words, which in course of time came to be regarded as asserting something like the divine right of kings and their independence of any earthly power.

DEIAMEA or **DIAMBA**, an African name for hemp (q.v.), commercially known as Congo tobacco. The flowers are smoked for their narcotic effect.

DEIANIRA, dē-yā-nī'rā, in Greek mythology, daughter of Althaea by Oeneus, king of Aetolia, or possibly by Dionysus, and wife of Heracles (Hercules). She was the unwitting cause of her husband's death, when to regain his affections, which he had bestowed on a captive princess, she sent him a robe smeared with the poisoned blood of the centaur Nessus (q.v.), who had assured her that it was a potent philter to recapture lost love. In despair she committed suicide. Sophocles' *Trachiniae*, a tragedy, tells the story.

DEIDAMIA, dē-id-ā-mī'ā. (1) In Greek mythology, daughter of Lycomedes, king of Scyros. When Achilles (q.v.) was in hiding there disguised in a girl's garments, she bore him a son, Neoptolemus (Pyrrhus).

(2) Epirote princess: d. Cilicia, 300 B.C. Sister of Pyrrhus I, king of Epirus, and wife of Demetrius I Poliorcetes, king of Macedon.

(3) Epirote princess: d. Ambracia, Greece,

c.235 B.C. Daughter of Pyrrhus II, king of Epirus, and last surviving member of the Aeacid dynasty of Epirus. She was murdered by her revolting subjects.

DEIMOS, dī'mōs, the name of the outer satellite of Mars, discovered in 1877 by Asaph Hall at the United States Naval Observatory, Washington, D.C. Deimos revolves about its primary in 30 hours and 18 minutes; its diameter is about 5 miles. Its period is but little longer than the Martian day. It rises in the east and goes through its phases twice before it sets. The inner satellite of Mars is Phobos (q.v.).

DEIOCES, dē'yō-sēz, king of the Medes: reigned c.699–647 B.C. His story by Herodotus has only the status of a legend. According to Herodotus, Deioces rose from a private station to be the founder of the Median empire. By acting as arbitrator in the disputes which took place in his own vicinity, he had acquired a high reputation for wisdom and justice. When the Medes, in consequence of their revolt against the Assyrians, stood in need of a sovereign, they found none whose claims to the honor seemed stronger than those of Deioces. Immediately after his election he assumed great state, surrounded himself with bodyguards and presumably built the city of Ecbatana (later Hamadan). Deioces is probably the legendary counterpart of one Dayukku, a tribal chieftain.

DEIOTARUS, dē-yōt'ā-rūs, Galatian tetrarch: d. 40 B.C. For his services in the Mithridatic Wars (88–64 B.C.) the Romans made him king of Galatia and of Lesser Armenia (58 B.C.). But when he supported Pompey the Great at Pharsalia (48 B.C.), Julius Caesar deprived him of his domains (47 B.C.), though he left him his royal title. Cicero defended him successfully in the extant oration *Pro Rege Deiotaro* (45 B.C.) on a charge of conspiracy against Caesar. Deiotarus aided Brutus and Cassius at Philippi (42 B.C.), but then deserted to Antony, who reinstated him in his kingdom.

His son Deiotarus Philopater briefly held the courtesy title of king (43 B.C.), but did not succeed him on the throne. His great-grandson Deiotarus Philadelphus was the last king of Paphlagonia (r. 36–6 B.C.).

DEIPHOBUS, dē-īf'ō-būs, in Greek legend, a son of Priam and Hecuba, who married Helen after the death of Paris. He was betrayed by Helen to the Greeks and slain by Menelaus.

DEIPNOSOPHIST, dīp-nōs'ō-fīst (Gr. *deipnosophistēs*), one learned in cookery. The plural *Deipnosophistai* (*Gastronomers*) is the title of the oldest surviving treatise on cuisine, written c.200 A.D. by Athenaeus (q.v.). Only 15 books (partly fragmentary) survive of this fictitious record of curious conversation among 24 Greeks and Romans (grammarians, musicians, jurists, philosophers, physicians—some historical, others fictional) at a banquet which lasted for three days in Rome. The discussion, while primarily on the gastronomic aspect of banquets, covers all entertaining ornaments of feasts. Besides preserving an otherwise lost chapter of Hellenistic social history, this treatise—a complete failure as an artistic work—is invaluable for preservation of thousands of quotations (some short, others long)

from over 800 authors and over 1,200 works, most of which would have perished except for the author's encyclopedic efforts.

DEIR EL-BAHRI, dir' (dār') āl-bā'h'-rī, temple site, Egypt, on the west bank of the Nile River near Thebes, opposite Karnak. The English archaeologist, Harry R. H. Hall, and the Swiss Egyptologist, Édouard Naville, working from 1903 to 1906 under the auspices of the Egypt Exploration Fund, unearthed here the Middle Kingdom funerary temple of Mentuhotep III of the XIth dynasty. Nearby are the ruins of a temple built by the XVIIIth dynasty queen, Hatshepsut, and designed by her architect, Senmut. This temple dates from about 1500 B.C. and was built on terraces up the hillside which edges the alluvial plain. On its walls are inscriptions and sculptures which record the story of Hatshepsut's birth and of her expedition to the land of Punt (probably Somaliland). The French Egyptologist, Gaston Maspero, discovered the royal mummies here in 1881, and a second discovery of concealed mummies was made here in 1891.

DEIRA, dā'ē-rā, Anglian kingdom of the second half of the 6th century A.D., stretching from the Tees to the Humber, extending inland to the border of the Celtic realm of Strathclyde, and occupying approximately the area of the modern Durham and Yorkshire counties. The first known king of Deira was Ælla, who became king in 559 after throwing off the supremacy of Bernicia, another Anglian kingdom. When Ælla died in 588, Deira was again subjugated by Bernicia. Edwin (q.v.), son of Ælla, returned to Deira as king after his ally, Redwald, defeated the Bernicians in 617. Edwin then united Deira and Bernicia as Northumbria and made York his capital. The union between Deira and Bernicia seems to have been rather unstable, for it was only under Edwin and other strong kings, either of Deiran or Bernician blood, that a real united Northumbria existed. After Edwin's death in 633 the throne of Deira went to Osric, his nephew. The next king, Oswald, reunited Northumbria. Edwin's Christian bride, Ethelburga, brought St. Paulinus to York where he became bishop in 625. The story seems to be authentic that the Anglo-Saxon slaves who attracted the attention of Pope Gregory I in the slave market of Rome were from Deira.

DEIRDRE, dē'r-drē, the fabulously beautiful heroine of an ancient Irish legend. She was the daughter of a courtier of King Conchobar of Ulster. At her birth it was foretold that her beauty would be the cause of great misery and destruction. Conchobar, to prevent the prophecy from coming true, said he would marry Deirdre when she grew up, and arranged to have her brought up in isolation so that her beauty might not be the cause of misfortune. Nevertheless she saw and fell in love with Naoise who, with his brothers, carried her away. Conchobar then sent Fergus to bring them all back, promising safety to Naoise and his brothers. He broke his promise, however, and killed the men. Deirdre committed suicide shortly afterward.

The details of this story vary in different versions. John Millington Synge's *Deirdre of the Sorrows* (1910) and William Butler Yeats' *Deirdre* (1907) are two of the plays inspired by the legend.

DEISM, dē'iz'm, belief in the existence of a God on the basis of nature and reason alone, with an accompanying denial of revelation. Etymologically, the words *deist* and *theist* are the same in meaning, only *deist* is from Latin and *theist* from Greek. Conventionally, however, they are widely different in import. The term *theist* is applied to any believer in God and revealed religion, whether that believer be a Christian, a Jew, a Moham-medan, or adherent of any other religion. A *deist* is one who believes in God, but rejects revelation.

The term *Deists*, or *freethinkers*, is usually employed to designate a series of writers who appeared in England in the 17th and 18th centuries and sought to establish natural religion upon the basis of reason and free inquiry, in opposition to all positive religions and without reference to supernatural revelation. Deism was the result of attempts to apply to religion some of the principles of the Enlightenment. Among the factors leading to formation of the deistic attitude was an increasing weariness with the endless theological and doctrinal controversies of the day. Also, the growth of scientific investigation during the 17th century—exemplified by the work of Isaac Newton—had created an awareness of the law, harmony, and order of the universe, and this gave rise to a concept of a rational God who worked through the laws of nature rather than through special miraculous acts. The growth of deism was given further impetus by the ideas of John Locke (1632-1704), though Locke himself affirmed his adherence to orthodoxy.

Often referred to as the "Father of English Deism" is Lord Edward Herbert of Cherbury (1583-1648). His works *De Veritate* (1624) and *De Religione Gentilium* (1663); English trans. 1709) were the result of his studies of ancient philosophies, especially Platonism, and his investigations of religions other than Christianity. Herbert demonstrated that all religions have in common certain basic elements; they have one supreme God around whom worship centers; devoutness and goodness are the chief components of such worship; there must be repentance for sin, and forgiveness follows; and, finally, the good and evil deeds of this life are appropriately rewarded or punished in the hereafter. Herbert did not repudiate Christianity, but expressed faith that man, through reason alone, could achieve a natural religion. He was far more moderate than most of the prominent deists who followed him, and his ideas did not win uniform acceptance by later deists.

Charles Blount (1654-1693) introduced criticism of the Scriptures into the deistic controversy. Matthew Tindal (1657-1733) in *Christianity as Old as the Creation* (1730) emphasized the law of nature and tried to apply rational principles to his discussion of revelation. John Toland (1670-1722) in *Christianity not Mysteriorous* (1696) claimed his work to be a theological application of John Locke's philosophy. The third earl of Shaftesbury, Anthony Ashley Cooper (1671-1713) in *Characteristics* criticized Christian doctrine and writings and the idea of revelation. Thomas Woolston (1670-1733) and Anthony Collins (1676-1729) gave allegorical interpretations, respectively, of the miracles of Christ and of Old Testament prophecies.

The ideas of the deists were strongly attacked by David Hume in *Natural History of Religion* (1757). Hume was skeptical about any application of reason to religion, believing that religious

feeling had its origin in the deeply rooted superstitions of human nature. He thus felt that reason and religion excluded each other.

Thomas Paine (1737–1809) and Elihu Palmer (1764–1806) were important American deists. Paine's *The Age of Reason* delved into comparative religion and offered analysis of the Old and New Testaments. Palmer was influenced by Paine. He led a deistic movement in the United States, organizing societies and preaching widely. His *Principles of Reason* (1802) contained his most important ideas.

DE KALB, BARON. See KALB, JOHANN.

DE KALB, city, Illinois, in De Kalb County, altitude 886 feet, is on the Chicago and North Western, the Chicago, Milwaukee, St. Paul and Pacific, and the Chicago Great Western railroads, and on state and federal highways, 60 miles west of Chicago. It manufactures pianos, screen wire, insulated wire, bedsprings, women's clothing, canned foods, truck bodies, electric motors, refrigeration machinery, furniture, and metal fencing. Government is by mayor and council. The city owns its water supply system. It has a municipal library and hospital, and is the seat of the Northern Illinois State Teachers College. Settled about 1838, De Kalb was incorporated in 1877. Pop. (1950) 14,000.

DE KAY, dē-kā', Charles Augustus, American poet and art critic: b. Washington, D.C., July 25, 1848; d. New York, May 23, 1935. He was the youngest of seven children of Commodore George C. de Kay (1802–1849) and Janet Halleck Drake, daughter of Joseph Rodman Drake (q.v.). Commodore de Kay, a New Yorker of Knickerbocker descent, had won his rank fighting for Argentina in the War of the Banda Oriental (1826–1828); returning to New York in 1833, after two years in Greece and Turkey, he married the poet's orphan before her 15th birthday.

In 1857 Charles and four older children were taken to Dresden, Saxony, by their widowed mother for schooling. The outbreak of the Civil War (1861) brought them home. His three brothers at the front, Charles continued his studies at a Connecticut military academy. Graduating at Yale in 1868, youngest in his class, he embarked on a literary career. A favorite of his sister Kate (Mrs. Arthur Bronson), at her salons in Paris and Venice he made the acquaintance of Continental, British, and American artists and authors, including Whistler, Henry James, and Robert Browning. The poet and editor R. U. Johnson, in a tribute in the *New York Times Book Review* (July 29, 1934), recalled that in the 1870's de Kay, "a handsome and spirited figure in New York life, was . . . one of the best equipped and all round literary men of that day . . . and of a rare scholarly precision of statement."

Four volumes of his poems appeared between 1880 and 1883: *Hesperus and Other Poems*, *The Vision of Nimrod*, *The Vision of Esther*, *Love Poems of Louis Barneval*. Literary and art editor of *The New York Times* (1876–1894), he was art editor of the *New York Evening Post* (1907) and associate editor of *Art World* (1915–1917). In 1894 President Cleveland appointed him consul general at Berlin where, during a three-year tour, he organized the Berliner Fechtklub dedicated to French and Italian style fencing, as practised at the Fencers Club he had

founded in New York in 1880. Other clubs he initiated included the Authors (1882), National Sculpture Society (1892), and the National Arts Club (1899) of which he was long managing director.

A strong oarsman and expert fencer, he had a well developed social instinct and a gift for friendship. Though not sympathetic to modern art, he was warmly appreciative of the work of many younger men. At the turn of the century, with his brother-in-law Richard Watson Gilder, he was a leading influence in American cultural life. His books include *lives and works of the French animal sculptor A. L. Barye* (1889) and the American artist Louis C. Tiffany (1917); also *Bird Gods* (1898), a study of European myths.

DEKEN, dā'kēn, Aagje, Dutch author: b. Amstelveen, near Amsterdam, Nov. 14, 1741; d. Nov. 14, 1804. With Elizabeth Bekker (q.v.) she collaborated in several novels, and was author of *Liederen voor den Boerenstand* and *Liederen voor Kinderen*, descriptive of the home life of her times.

DEKKER, dēk'ēr, Eduard Douwes (pseudonym MULTATULI), Dutch author: b. Amsterdam, Mar. 2, 1820; d. Nieder-Ingelheim, Feb. 19, 1887. After years of official service in the Dutch East Indies he resigned, a bitter critic of government policies. His story, *Max Havelaar* (1860), exposes administrative scandals in Java. Later he published works on social, political and philosophical themes in a satiric vein. They include the admirable *Parables*; a novel, *La Sainte Vierge*; and a drama, *Vorstenschool* (*School of Princes*). His widow published his *Letters and Works*, 10 vols. (1892).

DEKKER, or **DECKER**, Jeremias de, Dutch poet: b. Dort, c.1609; d. Amsterdam, 1666. He gained first recognition by his poetical rendering of the *Lamentations of Jeremiah*. His powerfully satiric *Love of Gold*, his *Good Friday*, or *Christ's Passion*, and several lyrics are still admired. Dekker's *Puntdichten* (*Epigrams*) are Dutch classics.

DEKKER or **DECKER**, Thomas, Elizabethan and Jacobean dramatist: b. London, 1572?; d. ?1632. He is first mentioned as a dramatic writer in 1597. Ben Jonson satirized him in *The Poetaster* and Dekker took his revenge in *Satiromastix* (1602). Virtually nothing is known of his personal life save that he was often in straits and several times imprisoned for debt. His numerous nondramatic works include *Seven Deadly Sins of London*, a moral tract (1606); the *Double P P*, an anti-Catholic tract; *A Knight's Conjuring*, introducing the shades of Chaucer, Spenser and other dead poets; and *The Guls Hornebooke* (1609). He often collaborated with other dramatists of markedly different styles—with Massinger in *The Virgin Martyr*, Ford in *The Son's Darling*, Middleton in *The Roaring Girl* (1611), also with Webster and Chettle. Saintsbury considers as characteristic of his individual manner: *The Shoemaker's Holiday*, *Old Fortunatus*, *Satiromastix*, *Patient Grissil*, *The Honest Whore*, *The Whore of Babylon*, *If it be not Good the Devil is in it*, *The Son's Darling*, and *The Witch of Edmonton*. Shepherd edited his dramatic works (4 vols. London 1873), and Grosart the others (5 vols., 1884–1886).

DE KOVEN, Henry Louis Reginald, American composer: b. Middletown, Conn., April 3, 1859; d. Chicago, Ill., Jan. 16, 1920. He was graduated at Oxford in 1879 and studied music in Europe. On his return from Europe in 1882 he took up his residence in Chicago, but subsequently moved to New York. In 1897 he moved to Washington where he organized and conducted the Washington Philharmonic Orchestra. He then returned to New York as musical critic of the *World*. His scores show refinement of instrumental coloring and harmony. His operettas had great success, notably *The Begum*; *Don Quixote*; *Robin Hood*, his greatest success; *The Fencing Master*; *The Three Dragoons* (1899); *The Student King* (1906); *Rip Van Winkle* (1920). He also composed many songs, including *Oh, Promise Me* and *A Recessional*, and various music for piano and orchestra.

DE KOVEN, James, American Episcopal clergyman and educator: b. Middletown, Conn., Sept. 19, 1831; d. Racine, Wis., March 19, 1879. He was educated at Columbia College and at the General Theological Seminary in New York. After his ordination to the priesthood in 1855, he took a pastoral charge at Delafield, Wis., and at the same time became principal of the preparatory school for Nashotah Seminary, founded two years earlier. In 1859 this became Racine College and De Koven its first warden. He soon acquired a marked influence throughout the West, both in educational and ecclesiastical matters, in the latter taking up and carrying forward the teachings of the Oxford Movement (q.v.). His most prominent appearance in this connection was in the General Convention of 1871, at a time when the ritual controversy ran very high. In bold and outspoken terms, which have become historical, he proclaimed and defended his position, with a marked effect on the legislation under discussion. When, however, in 1875, he was elected bishop of Illinois, a considerable majority of the standing committees of the other dioceses refused to confirm his election, regarding his views as dangerous. He labored diligently for the upbuilding of Racine College, where he remained until his death. The published volume of his sermons (1880) contains a preface which gives some idea of his commanding position in the church life of his time.

DE KROYFT, dé-kroif't, Susan Helen Aldrich, American author: b. Rochester, N. Y., Oct. 29, 1818; d. Dansville, N. Y., Oct. 25, 1915. She was graduated at Lima College, New York, 1843, and married Dr. William De Kroyft, of Rochester, who was killed on his wedding day by a fall from a carriage. Mrs. De Kroyft shortly afterward became blind. Her works include: *Little Jakry* (1871); *Darwin and Moses, A Place in Thy Memory* (1849; revised 1905). *Mortara* (1888); *The Foreshadowed Way* (1901); and *The Soul of Eve* (1904).

DE KRUIF, dê-krif', Paul, American author and bacteriologist: b. Zeeland, Mich., March 2, 1890. He was educated at the University of Michigan and was bacteriologist there (1912-1917) and at the Rockefeller Institute (1920-1922). Since then he has written *Our Medicine Men* (1922); *Microbe Hunters* (1926); *Hunger Fighters* (1928); *Seven Iron Men* (1929); *Men Death* (1932); *The Fight for Life*

(1938); *Health is Wealth* (1940); *Kaiser Wakes the Doctors* (1943); *The Male Hormone* (1945); and others.

DELABARRE, Edmund Burke, American psychologist: b. Dover, Me., Sept. 25, 1863; d. Providence, R. I., March 16, 1944. He was graduated at Amherst College in 1886, and studied at Harvard and Freiberg. In 1891-1896 he was associate professor and from 1896-1932, professor of psychology at Brown University. In 1896-1897 he was director of the Psychological Laboratory at Harvard. He was a member of the American Psychological Association and Fellow of the American Association for the Advancement of Science. He wrote *Ueber Bewegungsempfindungen* (1891); *Inscribed Rocks of Narragansett Bay* (1923); *Dighton Rock—A Study of the Written Rocks of New England* (1928).

DELABORDE, COUNT Henri, French painter and art critic: b. Rennes, May 2, 1811; d. Paris, May 18, 1899. A pupil of Paul Delaroche, his canvases are on view in Dijon, Raismes, Amiens, and Versailles. Conservator of the print collection at the Bibliothèque Nationale, 1855-1885, he wrote *Lettres et Pensées d'Hippolyte Flandrin* (1865), a life of Ingres (1870), and a history of the Académie des beaux-arts (1891). His son, Count Benigne Marie Henri François (1854-1927), was a noted medievalist, writer, and editor.

DELACROIX, dê-lâ-krwâ', Ferdinand Victor Eugène, French painter: b. Charenton-Saint-Maurice, near Paris, April 26, 1798; d. Paris, Aug. 13, 1863. His father was an ardent revolutionist who died when Eugene was seven years of age. He was sent to the Lycée Napoleon and then to the atelier of Pierre Narcisse Guérin to study painting. His first painting, *Dante and Virgil in the Infernal Regions*, attracted much notice in the exhibition of 1822. This picture displayed a wide departure from the coloring and manner of the school of Jacques Louis David, and accordingly it gave rise to enthusiastic praise on the one side; on the other to contemptuous depreciation, but everywhere to wonder. His *Massacre of Scio* (1824) was a declaration of war against the school of the classicists, who named it a "Massacre of Painting." These were followed by the *Execution of the Doge Marino Falieri* (1826); the *Death of Sardanapalus* (1827); and the *Murder of the Bishop of Liège* (1830)—pieces painted with fire and vigor. His sympathy with the revolutionary party was shown by his celebrated picture of the *Goddess of Liberty at the Barricades*. In 1831 he joined the embassy sent by Louis Philippe to the emperor of Morocco. To this journey we are indebted for several pictures remarkable for their vivid realization of Oriental life as well as their masterly coloring. They are the *Jewish Marriage*; *Muley Abderrahman With His Body-guard*; *Algerian Ladies in Their Chamber*; *Moorish Soldiers at Exercise*; and several scenes of common life. In spite of his genius Delacroix failed in gaining popularity with the general public. He was commissioned not only with the decoration of the Luxembourg Palace, the Chambre des Députés, and the Louvre, but large paintings were executed by him for the Parisian churches. The Versailles museum contains two of his master-

pieces—the *Battle of Taillebourg* (1837), and the *Taking of Constantinople by the Crusaders* (1841).

Delacroix created in a savage frenzy, which his friend, the poet Charles Pierre Baudelaire, compared to "a volcano artistically hidden by bouquets of flowers." According to Alfred Robaut and Ernest Chesneau who, besides Maurice Tournoux and Théophile Silvestre, catalogued Delacroix' works, he painted no fewer than 853 canvases, 1,525 pastels and water colors, and made 6,629 drawings, including the sketches for his monumental decorative compositions. This vast output comprised, along with the exotic material gathered in his travels and scenes of contemporary wars and revolutions, many subjects for which Delacroix drew inspiration from the classics of literature; the Bible, Homer, Aeschylus, Virgil, Dante, Shakespeare, Ariosto, Goethe, Scott, and Byron, all provided him with material for canvases of tragic violence.

Notable works of Delacroix are owned privately in the United States as well as by leading galleries. The *Abduction of Rebecca* (1846), *Christ on Lake Gennesaret*, and *George Sand's Garden at Nohant* are in the Metropolitan Museum of Art, New York; the Walters Art Gallery, Baltimore, has three canvases; other representative works are to be found in the Fogg Museum, Cambridge, Mass.; Minneapolis Institute of Arts; Phillips Memorial Gallery, Washington, D.C.; Cincinnati Art Museum; and Chicago Art Institute.

Consult Escholier, Raymond, *Delacroix, peintre, graveur, écrivain*, 3 vols. (Paris 1926-29); Delacroix, Eugène, *Correspondence générale*, ed. André Joubin, 5 vols. (Paris 1936-38); id., *Journal*, tr. by Walter Pach (New York 1937); Baudelaire, C. P., *Eugène Delacroix: His Life and Work*, tr. by J. M. Bernstein (New York 1947).

DELACROIX, Henri Edmond (pseudonym HENRI EDMOND CROSS), French painter: b. Douai, France, May 20, 1856; d. St.-Clair, May 16, 1910. Persuaded by his teacher, François Bonvin, that it would be disadvantageous to exhibit under the same name as the famous Eugène Delacroix, he took the name of Cross and began to show at the Salon in Paris in 1881. At first he was influenced by Claude Monet and the impressionists, but in 1891 the pointillist experiments of Georges Seurat and Paul Signac captured his imagination and he became a member of the neoimpressionist school. Among his better known oil paintings are *Vieilles choses* (1883), *Un après-midi au Luxembourg* (1891), and *les Moneghetti* (1893).

DELACROIX, Léon, Belgian statesman: b. 1865; d. Baden-Baden, Germany, Oct. 15, 1929. A lawyer and member of the Belgian Catholic Party, he was premier of a coalition government in Belgium from 1919 to 1921, and then was chosen to represent his country on the Reparations Commission set up under the Treaty of Versailles. He was attending the conference which organized the Bank for International Settlements when he died.

DELAFIELD, dē'lā-fēld, Edward, American ophthalmologist: b. New York, N. Y., May 7, 1794; d. there, Feb. 13, 1875. He was educated at Yale and at the College of Physicians and Surgeons (now a part of Columbia University), and after a year of further study in Eu-

rope, began to practice in New York City. He soon started to specialize in diseases of the eye and in 1820, with Kearny Rodgers, founded the New York Eye Infirmary. In 1825 he prepared an American edition of *Synopsis of the Diseases of the Eye, and Their Treatment* by the English surgeon Benjamin Travers, adding notes and supplementary material of his own. In the same year Delafield was appointed professor of obstetrics and diseases of women and children at the College of Physicians and Surgeons, a position which he continued to occupy for the next 13 years. He became president of the college in 1858 and remained in that office until his death. He was first president of the American Ophthalmological Society (1864).

DELAFIELD, Francis, American pathologist: b. New York, N. Y., Aug. 3, 1841; d. Noroton, Conn., July 17, 1915. The son of the ophthalmologist Edward Delafield (q.v.), he was graduated from Yale and received his degree in medicine from the College of Physicians and Surgeons, Columbia University, in 1863. Continuing his studies in Europe, he came under the influence of the German pathologist Rudolf Virchow, and decided to devote himself to research in pathological anatomy. In 1876 he became adjunct professor of pathology at the College of Physicians and Surgeons, and in 1882 full professor, retiring in 1901.

Delafield made important discoveries in connection with nephritis and diseases of the colon, and was the first to differentiate between lobar and bronchial pneumonia. His *Handbook of Post Mortem Examinations and of Morbid Anatomy* was a standard text for over half a century. First published in 1872, it was revised and enlarged with the aid of Theophil Mitchell Prudden in 1885 and had gone through 12 editions by 1922. Delafield also wrote *Manual of Physical Diagnosis*, with Charles F. Stillman (1878), and *Studies in Pathological Anatomy* (1878-1891). With Sir William Osler and others he was a founder and first president of the Association of American Physicians (1886).

DELAFIELD, Richard, American military engineer: b. New York, N. Y., Sept. 1, 1798; d. Washington, D.C., Nov. 5, 1873. He was graduated from the United States Military Academy in 1818, and later was its superintendent for two periods, 1838-1845 and 1856-1861. Upon graduation his first assignment was that of topographical draftsman to the American Boundary Commission appointed under the Treaty of Ghent. Later he was assistant engineer on the construction of fortifications at Hampton Roads, Va. (1819-1824), superintended the improvement of defenses on the Mississippi River (1824-1832), and was in charge of construction on the Cumberland Road and at Fort Delaware (1832-1838). During the Civil War, he helped to organize and equip New York State forces, and was superintending engineer of the defenses of New York harbor. In 1864 he was made chief of engineers of the United States Army, and was in charge of the Engineer Bureau in Washington, D.C., until 1866, when he retired with the rank of major general. Remarkable for his draftsman-ship, he illustrated as well as wrote a *Report on the Art of War in Europe in 1854-56*, published by Congress in 1860, recording his observations in the Crimean war theater.

DELAKE, dē-lāzh', Yves, French zoologist: b. Avignon, May 13, 1854; d. Paris, Oct. 8, 1920. In 1886 he was appointed professor of zoology at the Sorbonne, and in 1901 he became director of the marine biology laboratory at Roscoff, Finistère. He made notable studies of heredity and reproduction, and was an authority on sponge culture. His works included *Traité de zoologie concrète*, 6 vols. (1896-1902) and *Les Théories de l'Evolution* (1909); an English translation of the latter was published in 1912.

DELAGOA BAY, an inlet of the Indian Ocean on the southeast coast of Africa, within the Portuguese colony of Mozambique. The inlet is 55 miles in length and has a breadth of 21 miles. Lourenço Marques, a seaport on an excellent harbor at the head of Delagoa Bay, is the capital of the colony. A railroad, 347 miles in length, connects Lourenço Marques with Pretoria, in the Transvaal Province of the Union of South Africa.

Portuguese navigators discovered Delagoa Bay in 1502, and the area surrounding it was explored in 1544 by Lourenço Marques. The site of the city destined to bear his name was a Dutch trading settlement between 1721 and 1730, and subsequently both Portuguese and the British made conflicting treaties of cession with local chiefs. In 1868 the South African Republic (Transvaal) claimed an area of the bay, but the next year acknowledged Portuguese sovereignty. A dispute between Portugal and Great Britain concerning certain islands in the bay was referred in 1872 to arbitration by the president of the French Republic; Portugal was favored in the decision announced in 1875. An arbitral award in 1900 required Portugal to pay an indemnity of nearly £1,000,000 for seizure of the British-built railroad from Lourenço Marques to Pretoria.

DE LA MARE, dē là mār', Walter (John), British poet and novelist: b. Charlton, Kent, April 25, 1873. He attended St. Paul's School, London, and at the age of 16 he became a clerk in the statistical department of an insurance office. His first work to be published was *Kismet*, a short story appearing in *The Sketch* in 1895, and two years later the *Cornhill Magazine* printed *The Moon's Miracle*. Using the anagram-pseudonym "Walter Ramal," his first book, *Songs of Childhood*, was published in 1902. Through the instrumentation of Sir Henry Newbolt, the poet, the British government made him a small grant in 1908 and granted him a pension of £100 a year to enable him to concentrate on writing. In 1904 came a prose work, *Henry Bracken*, in which the hero goes on a journey and meets characters in the works of Shakespeare, Wordsworth, Charlotte Brontë, Herrick, Swift, Bunyan, Keats, and others. He published *Poems* (1906), and then came the whimsical novel, *The Return* (1910), which showed again his individual power of combining fantasy with reality. In 1912 *The Listeners* established a reputation which grew till he was recognized as one of the leading Georgian poets. Subsequent volumes confirmed his acute ear for the music of words and keen sense of their subtlest shades of meaning. Much of his poetry is whimsical and fantastic, and some of it simple and delicate as nursery rhymes. In 1921 he made a brief return to prose with his sensitive biography, *The Memoirs of a Midget*; this won the James Tait Black Memorial Prize

in 1922. His later volumes included *This Year, Next Year* (1937); *Memory, and Other Poems* (1938); *Behold, This Dreamer* (1939); *Pleasures and Speculations* (1940); *Bells and Grass* (1941); *Collected Poems* (1942); *Love* (1943); *Collected Rhymes and Verses* (1944); *The Burning Glass* (1945).

DELAHORE, dē-lāh'br', Jean Baptiste Joseph, French astronomer: b. Amiens, France, Sept. 19, 1749; d. Paris, Aug. 19, 1822. In 1790, eight years after the discovery of Uranus, Delahore published the tables of that planet, although in that period it had but performed a small part of its 80 years' course. He also constructed tables of Jupiter and Saturn and of the satellites of Jupiter. In 1792 he was appointed to measure the arc of the meridian between Dunkirk and Barcelona for the French government. With his associate, Pierre F. A. Méchain, he completed this work in 1799. He became a member of the Institute when it was organized in 1795, and in 1803 he was appointed perpetual secretary of the section of mathematical sciences. In 1807 he succeeded Joseph Lalande as professor of astronomy at the Collège de France; the same year he announced discovery of four formulas (Delahore's analogies) in spherical trigonometry. His published works included *Base du système métrique*, 3 vols. (1806-1810); *Histoire de l'astronomie ancienne*, 2 vols. (1817); *Histoire de l'astronomie au moyen âge* (1819); *Histoire de l'astronomie moderne*, 2 vols. (1821).

DE LANCEY, James, American colonial administrator: b. New York City, Nov. 27, 1703; d. July 30, 1760. He attended Cambridge University and studied law in London, then practising in his native city. In 1731 he became a judge of the New York State Supreme Court, and from 1733 until his death he was its chief justice. He led the opposition to the policies of Gov. George Clinton (1743-1753) and served as lieutenant governor (1753-1755 and 1757-1760). His brother, OLIVER DE LANCEY (1718-1785), was a Loyalist during the American Revolution, holding the rank of brigadier general in the British army; his lands were confiscated and he went to England, dying in Beverley, Yorkshire. JAMES DE LANCEY (1732-1800), son of James De Lancey (1703-1760), was a member of the New York State Assembly, where he introduced a resolution demanding the redress of the colonists' grievances by the British government. He went to England to present the views of the people, and stayed there after his mission had failed. For the confiscation of his estates in New York he was awarded \$160,000 in compensation. He died at Bath, England.

DELAND, dē-lānd', Margaret Wade (Campbell), American novelist: b. Allegheny, Pa., Feb. 28, 1857; d. Boston, Mass., Jan. 13, 1945. Following her marriage in 1880 to Lorin F. Deland she made her home in Boston. She attracted wide notice by her first novel, *John Ward, Preacher* (1888). *Old Chester Tales* (1899) and *Dr. Lavendar's People* (1903) were gentle studies of village life which she continued to depict in such volumes as *The Awakening of Helena Richie* (1906); *The Iron Woman* (1911); *Old Chester* (1915); *The Rising Tide* (1916); and *The Kays* (1926). Her autobiography, entitled *If This Be I (As I Suppose It Be)*, was published in 1935.

DE LAND, də-länd', city, Florida, Volusia County seat; on the Atlantic Coast Line Railroad and on state and federal highways; 22 miles west-southwest of Daytona Beach. Industries include lumbering and lumber mills, fruit packing, and poultry and fruit farming; it is also a shipping center for citrus fruits. It is a winter resort, has a Carnegie library, and is the seat of John B. Stetson University. Ponce de Leon springs are just north of the city. Pop. (1940) 7,041; (1950) 8,652.

DELANE, də-lān', John Thaddeus, English newspaper editor: b. London, Oct. 11, 1817; d. near Ascot, Nov. 22, 1879. Educated at Magdalen College, Oxford, he became a member of the bar at Middle Temple in 1847 although he never practiced. As editor of the *Times* from 1841 to 1877, he exercised caution in substantiating news of foreign affairs and closely supervised the work of his correspondents. Under his direction, the paper had considerable influence.

DELANO, děl'-ā-nō, Columbus, American lawyer and politician: b. Shoreham, Vt., June 5, 1809; d. Mount Vernon, Ohio, Oct. 23, 1896. He was elected a member of Congress in 1844, 1864, and 1866. In President Grant's first term he was commissioner of internal revenue and in 1870 became secretary of the interior. A congressional investigation found him guilty of negligence and incompetence in the Bureau of Indian Affairs, and he resigned in 1875.

DELANO, Jane Arminda, American nurse: b. Townsend, N. Y., March 12, 1862; d. Savenay, France, April 15, 1919. She graduated from the Bellevue Hospital School of Nursing, New York City, in 1886, and during 1891-1896 she was superintendent of nurses at the University of Pennsylvania Hospital School of Nursing. During 1909-1911 she served as superintendent of the United States Army Nurse Corps and was associated with the American Red Cross. As director of the Red Cross department of nursing during World War I, she supplied 20,000 nurses for duty both in France and the United States.

DELANO, də-lā'nō, city, California, Kern County; altitude 320 feet; 30 miles north-northwest of Bakersfield; on the Southern Pacific Railroad. Industries include grape, potato, and cotton farming, the manufacture of concrete pipe, and wineries. Pop. (1940) 4,573; (1950) 8,717.

DELANY, də-lā'nī, Martin Robinson, American Negro leader: b. Charles Town, Va. (now W. Va.), May 6, 1812; d. Xenia, Ohio, Jan. 24, 1885. Of free Negro parentage, he received his education in Pittsburgh where, in 1843, he founded *Mystery*, a small newspaper. During 1847-1849 he was associated with Frederick Douglass at Rochester, N. Y., in publishing the *North Star*. In 1852, while studying medicine at Harvard University, he wrote *The Condition, Elevation, Emigration, and Destiny of the Colored People of the United States, Politically Considered*. A founder of the first National Emigration Commission in 1854, he was selected by that body in 1858 to lead an expedition for the exploration of the valley of the Niger; he embarked early the following year. In 1865 he was commissioned a major in the United States Army Medical Corps, being the first Negro to

occupy such a post. Subsequently he was employed in the Freedmen's Bureau; became a justice in Charleston, S. C.; and headed the Honest Government League. In 1879 he published *Principia of Ethnology: the Origin of Races and Color*.

DELANY, Mary Granville, English correspondent of Dean Swift: b. Coulston, England, May 14, 1700; d. April 15, 1788. The niece of Lord Lansdowne, she married Alexander Pendarves in 1717/1718. After his death in 1724 she visited Ireland where she met Swift and his friend Patrick Delany (1685?-1768), an Irish preacher, whom she married in 1743. George III gave her a house at Windsor after the death of her second husband. She is remembered for her patronage of Fanny Burney and as author of *Autobiography and Correspondence of Mary Granville* (6 vols., 1861-1862).

DE LA RAMEE, Marie Louise. See OUIDA.

DE LA REY, də lā ri', Jacobus Hercules, South African military leader: b. Lichtenburg district, Transvaal, Oct. 22, 1847; d. Johannesburg, Sept. 16, 1914. Elected to the Volksraad of the South African Republic (Transvaal) in 1893, he supported the progressive policies of Gen. Petrus Jacobus Joubert, in opposition to the reaction personified by President Paul (Stephanus Johannes Paulus) Kruger. Given the rank of general on outbreak of the South African War (q.v.), he fought in the western Transvaal during the early period of the campaign, distinguishing himself at Magerfontein in 1899 and leading his men skillfully as they withdrew in 1900 before the troops of Lord Roberts; on March 7, 1902, he captured Lord Methuen at Klerksdorp, but released him when unable to treat his wounds. He was a signatory to the Peace of Vereeniging, and later persuaded Boer prisoners detained in India to take the oath of allegiance to Britain. When the Transvaal became a self-governing colony in 1907 he entered the first Legislative Assembly. At the beginning of World War I he opposed the plan of Prime Minister Louis Botha, to invade German South West Africa. Implicated in a revolt, he was shot dead by a police patrol.

DELAROCHE, də-lā-rôsh', (Hippolyte) Paul, French painter: b. Paris, July 17, 1797; d. there, Nov. 4, 1856. He entered the studio of Antoine Jean Gros and became a portrait and historical painter of note. His subjects were taken principally from French and English history. Among others may be mentioned the *Death of Queen Elizabeth*, admired by French and generally condemned by English critics; *Children of Edward IV*; *Cromwell Contemplating the Dead Body of Charles I* (1831), at Nimes Museum, one of Delaroche's more important works; and the *Death of the Duke of Guise* (1835) in the Chantilly Museum. His chief work is considered to be the pictorial decoration of the hemicycle of the École des Beaux-Arts, on which he was engaged from 1837 to 1841. Despite the great detail of his work which is distracting, his pictures are brilliant and harmonious in color, and the great distinctness and perspicuity in treatment make his work at once intelligible.

Consult Halévy, Ludovic, *Notice sur la vie et les ouvrages de Paul Delaroche* (Paris

1858); Richard Muther, *History of Modern Painting* (London 1907).

DE LA RUE, dĕl'ă-rĕo, Warren, British astronomer; b. Guernsey, Jan. 15, 1815; d. London, April 19, 1889. In 1850 he constructed a 13-inch reflecting telescope, mounted first at Canonbury and later at Cranford, Middlesex. He invented in 1858 a photoheliograph for making daily photographs of the sun; he described it in a report to the British Association entitled *On Celestial Photography in England* (1859). Other researches included a study of the discharge of electricity through gases. From 1864 to 1866 he was president of the Royal Astronomical Society.

DE LA WARR, Thomas West, 3d or 12TH BARON (known as LORD DELAWARE), colonial administrator in America; b. England (probably Wherwell, Hampshire), July 9, 1577; d. at sea, June 7, 1618. He was educated at Queen's College, Oxford University, and in 1597 became a member of the House of Commons for Lymington. Subsequently he served in the campaigns in the Low Countries and in Ireland, and in 1609 he was made a member of the council of the Virginia Company, in London. Appointed governor and captain general of the colony of Virginia in 1610, he arrived at Jamestown on June 10 just as the discouraged colonists were preparing to return to England. He restored order and comparative prosperity, and established a post at Riquotau (later Hampton), at the mouth of the James River. In 1611 he set sail for England to procure further aid for the colonists; at the outset of the voyage his vessel sought shelter from stormy weather at the mouth of the Chickohocki, a river subsequently named the Delaware. He published in London in 1611 *Relation . . . of the Colonie, Planted in Virginia*, a report favoring the enterprise. In March 1618 he sailed once more for Virginia, dying on the voyage.

DELATTRE or **DE LATTRE**, Roland. See LASSUS, ORLANDUS, or LASSO, ORLANDO.

DELAUNAY, dĕ-lō-nă', Jules Élie, French figure and portrait painter; b. Nantes, June 12, 1828; d. Paris, Sept. 5, 1891. He studied at the École des Beaux-Arts and, after winning the Prix de Rome in 1856, in Italy. His work in Paris includes several frescoes at the Opera House and 12 paintings in the Conseil d'État of Palais Royal; he also executed frescoes in the Church of St. Nicholas, Nantes. His *Diana* is in the Luxembourg Museum, Paris; and the museum at Nantes has his *Death of Nessus* and *Lesson on the Flute*.

DELAUNAY, Louis Arsène, French actor; b. Paris, March 21, 1826; d. Versailles, Sept. 22, 1903. He made his debut in 1845 at the Odéon, in *Tartuffe*, and in 1848 he appeared at the Comédie Française as Dorante in *Le Menteur*. Until his retirement in 1887 he played many young-lover parts with outstanding skill and charm. He was made a chevalier of the Legion of Honor in 1883.

DE LAUNAY, Marguerite. See STAAL DE LAUNAY, MARGUERITE JEANNE CORDIER.

DELAVAN, Wis., city in Walworth County, near Delavan Lake, on Rock River, 45 miles southwest of Milwaukee. It is served by the Chicago, Milwaukee, St. Paul, and Pacific Railroad. The surrounding country has fine dairy and livestock farms and numerous summer homes. The Wisconsin Institute for the Deaf and factories producing knitted wear, electric pumping equipment, and cigars are located in the city. Pop. (1950) 4,007.

DELAVIGNE, dĕ-lă-vĕn'y', Casimir, French poet and playwright; b. Le Havre, April 4, 1793; d. Lyon, Dec. 11, 1843. He was educated at the Lycée Napoleon in Paris, and in 1811 composed an ode on the birth of the king of Rome which won him a post in the revenue office. After Napoleon's abdication in 1815 he published *Les Messénienes*, an elegiac series deploring the faded glories of France. The patriotic fervor of these pieces raised him to the stature of a national poet. Among his dramatic works are *Les Vêpres Siciliennes*, a tragedy produced in 1818; *Comédiens* (1820); *Paria* (1821); *L'École des Vieillards*, his best comedy (1823); *La Princesse Aurélie* (1828); *Marino Faliero* (1829); *Louis XI* (1832); *Les Enfants d'Edouard* (1833); *Don Juan d'Autriche* (1835); *Une Famille au Temps de Luther* (1836); *La Popularité* (1838); *La Fille du Cid* (1839); and *Le Conseiller Rapporteur* (1840). When the liberal political opinions expressed in *Paria* alienated the patronage of King Louis XVIII, he secured through Louis Philippe, Duke of Orleans, a position as librarian of the Palais Royal, which he retained until his death. Two patriotic hymns, *La Parisienne* and *La Varsovienne*, written during the Revolution of 1830, became very popular. Delavigne's collected works were published posthumously, beginning in 1845.

DELAWARE, dĕl'ă-wăr, a Middle Atlantic state and one of the 13 original states of the Union. It is bounded on the north by Pennsylvania, on the west and south by Maryland, and on the east by the Atlantic Ocean and by Delaware River and Bay which separate it from New Jersey. It takes its name from the bay, which was first called Delaware by Sir Samuel Argall in 1610, in honor of Thomas West, Lord De La Warr (q.v.), governor of Virginia.

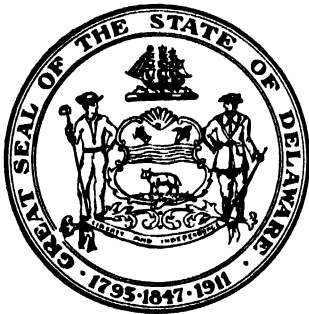


State flag.

Land area	1,978 square miles ¹
Water area	79 square miles ¹
Total area	2,057 square miles
Total including Delaware's share of Delaware Bay,	2,407 square miles

¹ According to "Land and Water Areas of Delaware," by F. J. Marachner and R. O. Bosman, *Delaware Notes*, 12th Series (Newark, Del., 1939), the land and water areas of Delaware are, respectively, 1,961.7 and 437.5 square miles.

Latitude	38°27'—39°50'
Longitude	75°2'—75°47'
Altitude	Sea level to 440 feet
Population (1950)	318,085
Capital city—Dover; Pop. (1950)	6,223
Ratified the Constitution	Dec. 7, 1787
Bird	Blue hen's chicken, approved April 14, 1930
Flower	Peach blossom, approved May 9, 1895
Motto	Liberty and Independence
Nickname	Diamond State
Song	<i>Our Delaware</i> , adopted April 7, 1925
Tree	Holly tree, adopted May 1, 1939



State seal.

Physical Characteristics.—Situated on the Delmarva Peninsula, Delaware lies for the most part on the Atlantic coastal plain with its flat to rolling sandy upland. The northern part of the state, comprising about 20 per cent of the area, is on the Piedmont plateau. The rocky hills of this area, rising from 60 to 440 feet, form a ridge west of Wilmington to divide the valleys of the Christina and Brandywine rivers. South of the hilly section, and running northwest to southeast through the remainder of the state, is a loamy ridge which follows the line of the Delaware Bay about 10 miles inland and forms the watershed for the streams on both sides of the peninsula. Flowing into the Delaware River on the east side of this watershed are Naaman's Creek, the Brandywine and Christina rivers, Appoquinimink Creek, Smyrna River, Duck and Little creeks, the St. Jones, Murderkill, and Mispillion rivers, Primehook, Broadkill, and Lewes creeks, and Indian River. Some of these water-courses are navigable for small steamers for as much as 10 or 11 miles. The streams flowing from the west side of the watershed, which feed into Chesapeake Bay, are the Marshyhope Creek, Broad Creek, and Nanticoke River.

Despite clearing and drainage projects which have converted many acres of marshland in the southwest to agricultural uses, there are still 81,000 acres of salt marsh and 35,000 acres of fresh marsh along the coastal plain. Among the largest of these low areas are Cypress (Great Pocomoke) and Ellendale swamps. The low level of this area also accounts for two large tidewater lagoons known as Rehoboth Bay and Indian River Bay. These shallow bodies of water are separated from the Atlantic Ocean by a long sandpit intersected by the Indian River Inlet, which permits navigation of light craft. In addition, Delaware has more than 50 fresh-water lakes and ponds.

The climate is moderate, with an average mean temperature of 52° in the north and 56° in the south, and an average annual rainfall of 40 to 45 inches. The prevailing winds are from the southwest in summer, and from the northwest in winter. Spring begins about April 1, and autumn frosts are expected about the middle of October.

Political Divisions.—The state is subdivided into three counties—New Castle, Kent, and Sussex—which came into existence in the late 17th century. The counties were formerly divided into hundreds, governmental units patterned after the English hundred and similar in function to the townships of Pennsylvania. Their boundaries are still perpetuated in a majority of the election, school, and assessment districts.

New Castle County, in the northern part of the state, has an area of 471² square miles. Wilmington, the county seat, is also the industrial center, port, and largest city of Delaware, as well as of the peninsula. The city's standard metropolitan area, which includes New Jersey's Salem County, had a 1950 population of 268,387.

Actually Wilmington is the center of a much larger trade area, extending farther into New Jersey and into Maryland, Virginia, and Pennsylvania. Wilmington is known as the Chemical Capital of the World, and, in addition to being the world's center for the manufacture of vulcanized fiber and glazed kid, produces railway cars, ships, and papermaking machinery. Here also are located the world's largest single cotton finishing and braided rubber hose manufacturing plants. Iron and steel products, machinery, and other metal goods have long been manufactured in the city. The nearby towns of Claymont, New Castle, Newark, Newport, and Edgemoor produce steel, chemicals, iron products, fiber, paper, and wood products. In the surrounding country are residential suburbs, large estates, and small farms.

Kent County, in the center, has an area of 599³ square miles. It is largely agricultural. Dover, the county seat and state capital, contains food canning and packing plants. Other centers are Smyrna, producing fertilizer and refrigerators, and Milford, which cans foods and makes dental supplies, boats, and woodenware.

Sussex County, in lower Delaware, has an area of 987⁴ square miles. The present county seat, Georgetown, is 15 miles inland from the Atlantic port of Lewes, the seat until 1790. Opposite Lewes is the famous Delaware Breakwater, which provides a safe harbor of over 300 acres with a depth of 24 feet. Here also are located menhaden fisheries which are among the largest in the world. Seaford, in the west, has a large nylon yarn plant built at a cost of \$8,500,000. At nearby Laurel are food processing, fertilizer, and basket plants.

The People.—The first settlers of Delaware were Swedes who colonized the present Wilmington area in 1638. They were succeeded in 1655 by the Dutch, who were conquered in turn by the English, in 1664. The population remained predominantly British (English, Scotch, and Irish) until the 1790's, when French refugees arrived from Santo Domingo. After 1850 there were immigrants from many of the countries of Europe and a very few from Asia and South America. Wilmington has Italian, Polish, Irish, and Russian sections and the remains of a German community. Of the 13,844 foreign-born residents of the state listed in the 1950 census, the great bulk lived in New Castle County, which includes the city of Wilmington. Nonwhites numbered 44,207 (including 43,598 Negroes), or 13.9 per cent of the population.

²493.03; ³806.13; ⁴1,100.07, according to "Land and Water Areas of Delaware," by F. J. Marschner and R. O. Bosman, *Delaware Notes*, 12th Series (Newark, Del., 1939).

In 1950 more than half the people (62.6 per cent) lived in urban areas. Between 1940 and 1950 the population of the state increased by 51,580 or 19.4 per cent to a total of 318,085.

Famous Men and Women.—Among Delaware's famous citizens were Caesar Rodney (near Dover, 1728-1784), signer of the Declaration of Independence; James Tilton (Kent County, 1745-1822), member of the Continental Congress; Oliver Evans (near Newport, 1755-1819), inventor; Jacob Jones (near Smyrna, 1768-1850) and Thomas Macdonough (Macdonough, 1783-1825), naval heroes of the War of 1812; Caesar A. Rodney (Dover, 1772-1824), United States attorney general; Louis McLane (Smyrna, 1786-1857), secretary of state and of the treasury; John M. Clayton (Dagsboro, 1796-1856), secretary of state; James A. Bayard (Wilmington, 1799-1880), United States senator; and H. A. du Pont (near Wilmington, 1838-1926), army officer and senator. Illustrious citizens of more recent times are Thomas F. Bayard (Wilmington, 1828-1898), secretary of state; George Gray (New Castle, 1840-1925), jurist; Howard Pyle (Wilmington, 1853-1911), artist; John Bassett Moore (Smyrna, 1860-1947), international lawyer; Annie Jump Cannon (Dover, 1863-1941), astronomer; Henry Seidel Canby (Wilmington, 1878-), author and critic; Thomas Holcomb (New Castle, 1879-), commandant, United States Marine Corps, 1936-1943; Eugene Reybold (Delaware City, 1884-), chief United States Army Engineers, 1941-1945; and John P. Marquand (Wilmington, 1893-), novelist.

Natural Resources.—The numerous streams of northern Delaware furnished power to run the early flour, textile, paper, and powder mills. Of the 707 million kilowatt hours of power produced in the state in 1951, however, only a tiny fraction was obtained from hydroelectric sources. These watercourses were also largely responsible for the development of the state's commerce. Mineral products are limited to granite, gravel for building materials, clays for brick and tile, and kaolin in the Wilmington area. Sand, much of which is used for building purposes, is abundant in Sussex County. The average annual value of minerals produced in the state in the period 1940-1951 was approximately \$450,000.

A large variety of trees are native to Delaware, including oak, hickory, sycamore, walnut, gums, maples, ash, chestnut, pine, and cypress. Magnolia, dogwood, and numerous flowering shrubs grow wild, and mallows are found in the swamps. Although most of the large tracts of hardwood have been cut, extensive tracts of pine exist in Sussex County which are used chiefly for piling and pit props. The state's 442,000 acres of forest land yielded about 34 million board feet of lumber in 1947.

The soil of Delaware consists mainly of loams, shading from the dark, rich soil of the north to the lighter soil of Kent County and the sandy soil of Sussex County.

The state's chief source of wealth among its natural resources lies in its aquatic life. The fish and oysters, and the hides of the muskrats which inhabit the marshes, yield many thousands of dollars each year.

Parks, Preserves, and Other Points of Interest.—Delaware contains two state parks and five state forests. In Fort Christina State Park, Wilmington, is the natural wharf of granite known as The Rocks where the Swedes landed in 1638. Here also is the Carl Milles monument presented in 1938 by the people of Sweden to the people of the United States to mark the tercentenary of the founding of New Sweden. Outstanding among the numerous buildings dating back to the colonial period are Old Swedes Church (1698) and the Old Town Hall (built in 1798 and now the museum of the Historical Society of Delaware), in Wilmington; Barratt's Chapel, the "Cradle of Methodism," built in 1780.

in Frederica; the Delaware State House (1787-1792), in Dover; and Amstel House (1730 or earlier), now a museum, and the courthouse where the colonial assembly met, both in New Castle. Most of the historic houses in New Castle and Dover are open to the public each year in May. In Lewes is the Zwaanendael Museum, a smaller-scale replica of the town hall in Hoorn, Holland. It was erected in 1931 to mark the tercentenary of the ill-fated Dutch colony of Zwaanendael (see section on *History*). At Winterthur, near Wilmington, the Henry Francis du Pont Winterthur Museum was opened in 1951.

The state forestry department controls 4,318 acres of wooded land, including Ellendale State Forest, which contains a public roadside camp. Under the jurisdiction of the state game and fish commission are 4,500 acres of land set aside as wildlife preserves, and there is a state fish hatchery at Moore's Lake, near Dover. The Bombay Hook Migratory Waterfowl Preserve, a 12-mile strip along the coast, is maintained by the United States Bureau of Biological Survey.

Production and Manufactures.—One of the chief sources of wealth in Delaware is the raising of a diversity of agricultural products. According to the 1950 census, about 851,291 acres were classified as farm land; the average farm covered 114.3 acres. With the exception of citrus and tropical fruits and vegetables, most agricultural commodities are produced commercially in the state. The total cash farm income reported in 1952 was \$103,803,000, of which about 80 per cent was derived from the sale of livestock and livestock products. By far the biggest source of income comprises chickens and broilers, accounting for between 60 and 70 per cent of the total. Delaware produces more broilers than all but two states, its output having increased from a reported 1,000 in 1923 to 68,451,000 in 1953. Between 25 and 35 per cent of the state's total crop income is represented by truck crops. Dairy production is confined mainly to the sale of fluid milk to supply cities. The largest dairy farms are in New Castle County.

The chief industrial area centers around Wilmington. Production there and elsewhere in the state in 1952, according to a survey by the Federal Bureau of the Census, created \$372,445,000 in value added by manufacture, and engaged an average of 58,670 workers who received \$239,593,000 in wages. Leading manufactures and their 1951 value added by manufacture were: chemicals, \$109,967,000; transportation equipment, including ships and boats, \$37,775,000; food and food products, \$33,198,000; and apparel, \$25,449,000. Other major products are leather, paper, textiles, machinery, and primary metals.

Aside from large quantities of fresh and salt-water fish and shellfish caught by sportsmen each year, there are larger quantities taken commercially. It is estimated that 2,266,000 pounds of oysters (worth \$1,047,660) and 4,652,500 pounds of blue crabs (\$330,718) were sold in 1951. The menhaden catch, for which the state is noted, totaled 166,488,700 pounds (\$1,911,375) in 1951.

Transportation and Communications.—Since the colonial period, Delaware has enjoyed an excellent geographic position with respect to national and world trade. The ports of Wilmington and New Castle on the deep Delaware River and Lewes on the Atlantic Ocean were

DELAWARE

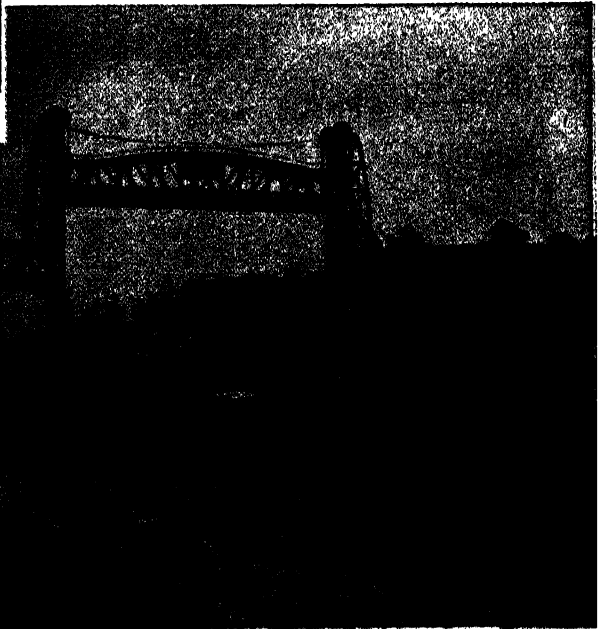
Right: The hall and stairway of Terry House at New Castle, which, like many other fine historic houses, is open to the public annually on Old New Castle Day in May

Courtesy Delaware State Development Department



Left: The Zwaanendael Museum, looking like a bit of old Holland, is a memorial to the Dutch settlers who first occupied, in 1631, the site upon which the town of Lewes now stands.

Courtesy Delaware State Development Department



Right: Vertical drawbridge and cargo ship on the Chesapeake-Delaware Canal. This is part of the inland waterway from New Jersey to Florida.

© Lawrence S. Williams



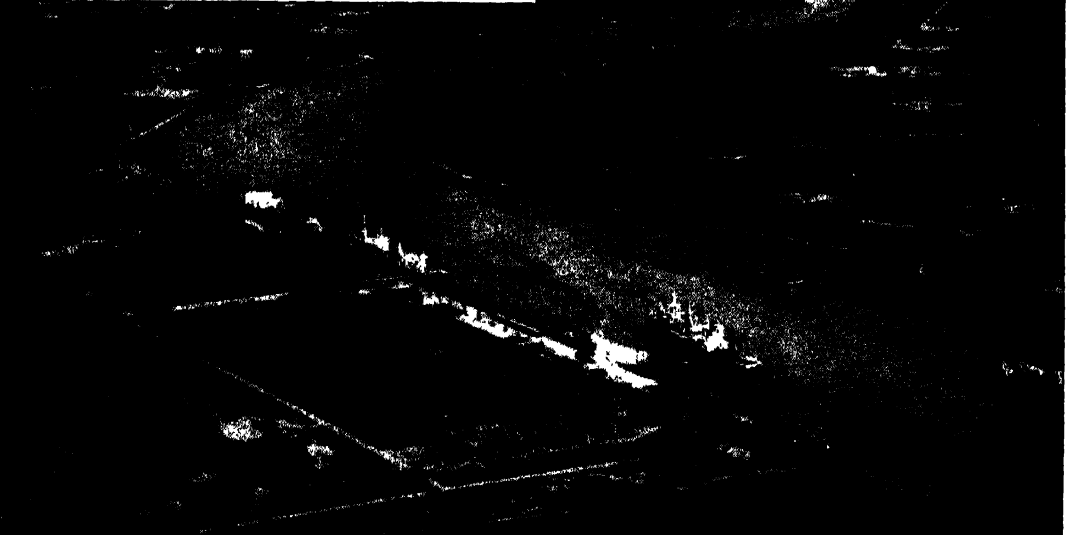
DELAWARE

Above: Legislative Hall, the state capitol of Delaware.

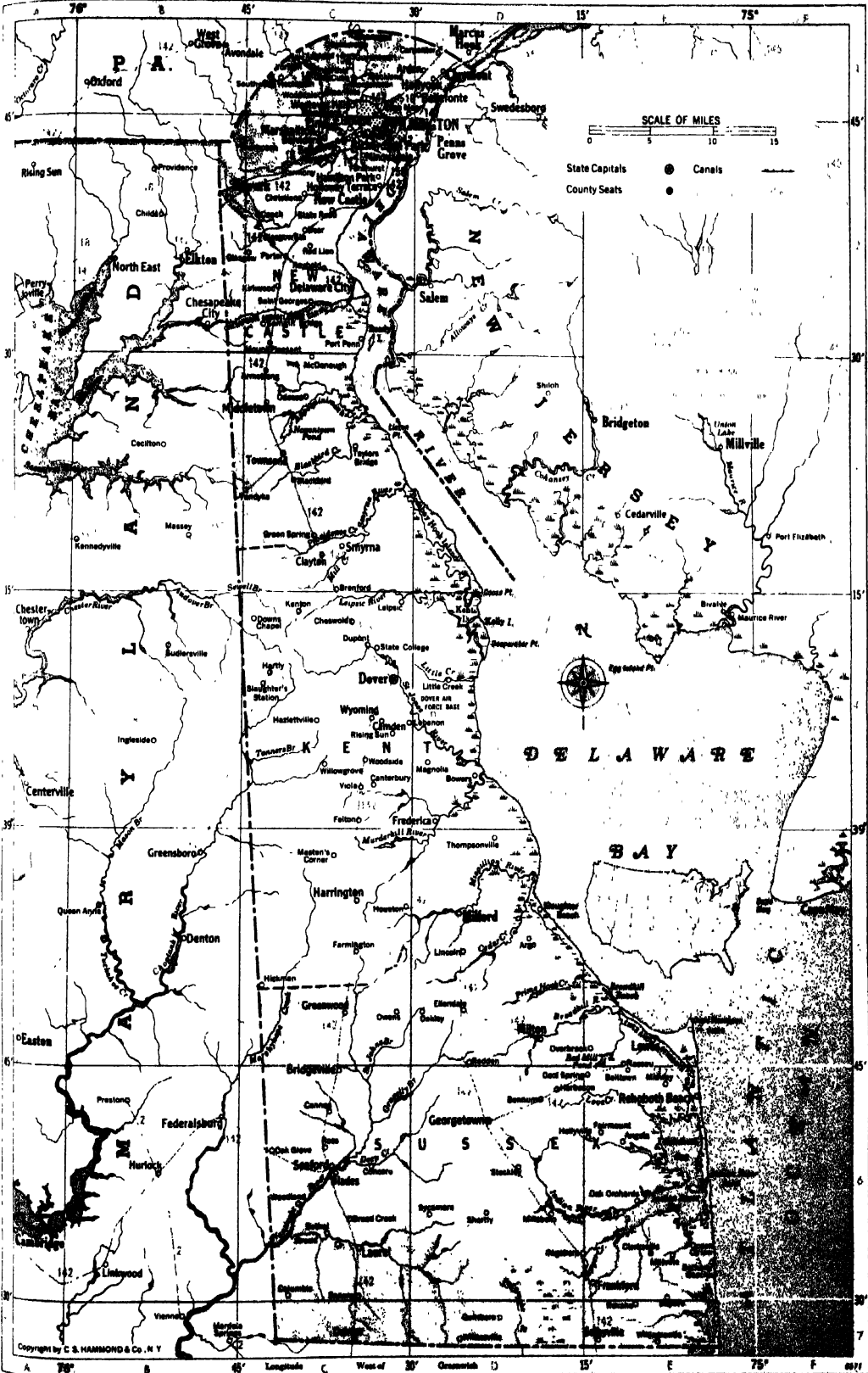
Left: Old Swedes Church in Wilmington, dating back to the colonial period (1698).

Below: Aerial view of the Wilmington marine terminal.

All photos courtesy Delaware State Development Department



DELAWARE



DELAWARE

Angola (E6).....	22	Delaware (bay) (E4)	
Arden (C1).....	842	Delaware (riv.) (C2)	
Argo (D5).....	75	Delaware City (C2).....	1,363
Armstrong (C3).....		Delmar (C7).....	1,015
Ashland (C1).....	65	DOVER (C4).....	8,223
Ashley (C2).....	860	Downs Chapel (C4).....	30
Bacons (C6).....	28	Dupont (C4).....	10
Bayard (E7).....		Edge Moor (C1).....	25
Bear (C2).....	150	Ellendale (D5).....	321
Bellefonte (D1).....	1,472	Elmhurst (C2).....	2,100
Bellemoor (C2).....	1,200	Elsmere (C2).....	5,314
Belltown (E6).....	250	Fairmount (E6).....	48
Belvidere (C2).....	850	Farmington (C5).....	113
Bennum (D6).....		Farnhurst (C2).....	150
Bethany Beach (E6).....	190	Felton (C4).....	455
Bethel (C6).....	271	Fort Miles (E5).....	
Blackbird (C3).....	50	Frankford (E6).....	615
Blades (C6).....	789	Frederica (D4).....	675
Bowers (D4).....	284	Georgetown® (D6).....	1,923
Brenford (C3).....	30	Glasgow (B2).....	
Bridgeville (C6).....	1,468	Glasgow Station (C2)	
Broad (creek) (C6).....		Granogue (C1).....	
Broad Creek (C6).....		Green Spring (C3).....	10
Broadkill		Greenville (C1).....	
(riv.) (D5).....		Greenwood (C5).....	748
Camden (C4).....	606	Gumboro (D7).....	50
Cannon (C6).....	150	Guyencourt (C1).....	
Canterbury (C4).....	50	Hamilton Park (C2).....	800
Carpenter (D1).....		Harbeson (D6).....	142
Centerville (C1).....	225	Harmony (C2).....	10
Chesapeake and Dela-		Harrington (C5).....	2,241
ware (canal) (C2)		Hartly (C4).....	139
Cheswold (C4).....	292	Hazlettville (C4).....	20
Choptank (riv.) (B5)		Henlopen	
Christiana (C2).....	500	(cape) (E5).....	
Clarksville (E6).....	150	Hickman (C5).....	200
Claymont (D1).....	5,370	Hockessin (C1).....	1,200
Clayton (C3).....	825	Holloway Ter.	
Columbia (C6).....	35	(C2).....	1,000
Concord (C6).....	100	Hollyoak (D1).....	1,450
Cooch (C2).....	12	Hollyville (D6).....	20
Cool Spring (D6).....	25	Houston (C5).....	332
Dagsboro (D6).....	474	Indian (riv.) (D6).....	
Deepwater		Indian River	
(point) (D4).....		(bay) (E6).....	

® County Seat

1950 Total Population 318,085

Indian River		Rehoboth Beach	
(inlet) (E6).....		(E6).....	1,794
Kenton (C4).....	211	Reybold (C2).....	
Kirkwood (C2).....		Richardson Park	
Laurel (C6).....	2,700	(C2).....	2,200
Lebanon (D4).....	150	Rising Sun (C4).....	150
Leipsic (C4).....	253	Rockland (C1).....	350
Leipsic (riv.) (C4).....		Ross (C6).....	10
Lewes (E5).....	2,904	Roxana (E7).....	100
Lincoln (D5).....	400	St. Georges (C2).....	
Little Creek (D4).....	268	St. Johns Br. Nanti-	
Magnolia (D4).....	207	coke (riv.) (C5).....	
Marshallton (C2).....	1,600	St. Jones (riv.) (D4)	
Masten's Corner		Seaford (C6).....	3,087
(C5).....	30	Selbyville (E7).....	1,086
Mc Donough (C3).....		Shortly (D6).....	
Middletown (C3).....	1,755	Silverbrook (C1).....	
Midway (E6).....	45	Slaughter Beach (D5).....	85
Milford (D5).....	5,179	Slaughter's Sta. (C4).....	15
Millsboro (D6).....	470	Smyrna (C3).....	2,346
Millville (E6).....	270	Smyrna (riv.) (C3).....	
Milton (D5).....	1,321	Southwood (C1).....	50
Minquadales (C2).....	1,500	State College (C4).....	450
Mispillion (riv.) (D5)		State Road (C2).....	
Montchanin (C1).....	500	Stockley (D6).....	
Mt. Cuba (C1).....		Summit Bridge (C2)	
Mt. Pleasant (C2).....	87	Sycamore (D6).....	
Murderkill		Tailors Bridge (C3).....	25
(riv.) (C5).....		Thompson (C2).....	4
Nanticoke (riv.) (C6)		Thompsonville (D5).....	25
Nassau (E5).....	120	Townsend (C3).....	441
New Castle (C2).....	5,396	Vandyke (C3).....	5
Newark (C2).....	6,731	Viola (C4).....	134
Newport (C2).....	1,171	Westover Hills (C1).....	900
Oak Grove (C6).....	50	Whitesville (D7).....	30
Oak Orchards (E6).....		Williamsville (E7).....	
Oakley (D5).....		Willowgrove (C4).....	65
Ocean View (E6).....	450	Wilmington®	
Odessa (C3).....	467	(D2).....	110,356
Overbrook (D5).....	50	Winterthur (C1).....	200
Owens (C5).....	30	Wooddale (C1).....	32
Port Penn (C2).....		Woodland (C6).....	50
Porter (C2).....	50	Woodside (C4).....	157
Red Lion (C2).....	50	Wyoming (C4).....	911
Redden (D5).....		Yorklyn (C1).....	500

shipping points for fast clipper ships carrying flour, other foodstuffs, and manufactured articles to the West Indies, Europe, and the Orient. A large variety of manufactured articles produced in Delaware and in neighboring states are now shipped to Wilmington by rail or truck and then exported overseas, and mineral products, jute, petroleum products, paper pulp, wood, and other raw materials are imported for fabrication there or for distribution. Wilmington Harbor's waterborne traffic for the five year period 1945-1949 averaged about 1,450,000 tons. Lewes has long been the home of the Delaware River pilots, who guide all shipping to Philadelphia and other ports. Here too is the Delaware Breakwater, of heavy granite masonry construction, 2,800 feet in length, exclusive of the icebreaker, which is 1,700 feet long. Built between 1828 and 1869 at a cost of \$2,125,000, it has saved many times that amount in shipping and cargoes threatened by storms. The waterborne commerce of the state is further aided by the Chesapeake and Delaware Canal (13½ miles long), which is an important link in the nation's inland waterways system. Begun in 1803 and completed in 1829, it was acquired by the federal government in 1919 and converted to a sea-level canal 250 feet wide and 27 feet deep. Thousands of tons of cargo are carried through it each month between ports on the Delaware River and Chesapeake Bay.

Northern Delaware has served as the gateway between the North and the South since before the revolution. Settlers passed through here into Kentucky and other areas beyond the Appalachians, and political leaders traveled this way to the Continental Congress at Philadelphia or to the infant capital at Washington. The same is true today. The main north and south lines of the Pennsylvania and Baltimore and Ohio railroads cross the northern part of the state, providing scores of trains connecting Wilmington with New York, Philadelphia, and Washington. In addition, Wilmington is the southern terminus of the Wilmington and Northern branch of the Reading Company, which serves the rich agricultural counties of Pennsylvania and the anthracite regions. This city is also the northern terminus of the Delmarva Division of the Pennsylvania Railroad, which provides rail facilities for the whole peninsula and connects with ferries running across Chesapeake Bay to Norfolk. Total railway mileage in the state comprises 919 track miles and line mileage of about 360.

A leader in the development of divided highways, Delaware has long been noted for its excellent roads, of which the T. Coleman Du Pont Boulevard is the best known. There are about 3,974 miles of highways in Delaware, of which approximately 3,193 miles are surfaced. These highways have not only developed rural areas, but they are responsible for a large volume of passenger and freight traffic. Delaware and the Maryland and Virginia counties on the peninsula provide much of the food for the metropolitan areas of Pennsylvania, New York, and New Jersey, and a large proportion of this produce is shipped by truck.

The large New Castle County Airport near Wilmington is a regular stop on the scheduled flights of three major airlines. It is connected by feeder lines with a network of airfields in other parts of the state. Radio communications are served by three broadcasting stations in Wilmington.

Economic and Financial Factors.—A balanced state budget presents a healthy fiscal condition in Delaware. Ample revenue is raised, chiefly from taxes and various licenses and franchises, to provide good highway, educational, health and welfare, agriculture, and conservation facilities. There are no sales, personal property, or corporate income taxes. Personal income tax rates are low, and the other chief sources of tax revenue are gasoline sales, alcoholic beverages, and parimutuels.

Delaware's 11 national banks, as of June 30, 1953, had \$36,866,000 in assets and \$31,855,000 in deposits, and the state's 60 other banks and branches (Sept. 30, 1953) held \$647,318,402 in assets and \$565,777,895 in deposits.

Government.—The present constitution of Delaware, adopted in 1897, is the fourth since statehood in 1776. It may be amended by a two-thirds vote of the members of two successive sessions of the General Assembly.

Executive.—The executive department consists of the governor, elected for a four-year term and ineligible for a third term, and the following elected officials: lieutenant governor, auditor, treasurer, attorney general, and insurance commissioner. The governor appoints the secretary of state, the various commissioners, judges, and administrative officials not under a commission. Senate confirmation is required if the remuneration exceeds \$500. Legislation can be passed over his veto only by a three-fifths vote of both houses of the General Assembly. The governor also grants pardons upon recommendation of the state board of pardons. A list of governors follows:

GOVERNORS OF NEW SWEDEN

Peter Minuit	1638
Peter Hollandaer	1640-1643
Johan Printz	1643-1653
Johan Papegoja	1653-1654
Johan Classon Rising	1654-1655

For governors from 1655 to 1682, see NEW YORK; and from 1682 to 1776, PENNSYLVANIA.

PRESIDENTS OF DELAWARE

John McKinly	1777
Thomas McKean, acting	1777
George Read, acting	1777-1778
Caesar Rodney	1778-1781
John Dickinson	1781-1782
John Cook, acting	1782-1783
Nicholas Van Dyke	1783-1786
Thomas Collins	1786-1789
Jehu Davis, acting	1789
Joshua Clayton	1789-1793

GOVERNORS OF DELAWARE

Joshua Clayton	Federalist	1793-1796
Gunning Bedford	"	1796-1797
Daniel Rogers, acting	"	1797-1799
Richard Bassett	"	1799-1801
James Sykes, acting	"	1801-1802
David Hall	"	1802-1805
Nathaniel Mitchell	"	1805-1808
George Truitt	"	1808-1811
Joseph Haslet	Democratic Republican	1811-1814
Daniel Rodney	Federalist	1814-1817
John Clark	"	1817-1820
Jacob Stout, acting	"	1820-1821
John Collins	Democratic Republican	1821-1822
Caleb Rodney, acting	"	1822-1823
Joseph Haslet	"	1823
Charles Thomas, acting	"	1823-1824
Samuel Paynter	Federalist	1824-1827
Charles Polk	"	1827-1830
David Hazzard	American Republican	1830-1833
Caleb P. Bennett	Democrat	1833-1836
Charles Polk, acting	"	1836-1837
Cornelius P. Comegys	Whig	1837-1841
William B. Cooper	"	1841-1845
Thomas Stockton	"	1845-1846
Joseph Maull, acting	"	1846
William Temple, acting	"	1846-1847

GOVERNORS OF DELAWARE (continued)

William Tharp	Democrat	1847-1851
William H. Ross	"	1851-1855
Peter F. Causey	Know Nothing	1855-1859
William Burton	Democrat	1859-1863
William Cannon	Union	1863-1865
Gove Saulsbury, acting	Democrat	1865-1867
Gove Saulsbury		1867-1871
James Ponder		1871-1875
John P. Cochran		1875-1879
John W. Hall		1879-1883
Charles C. Stockley		1883-1887
Benjamin T. Biggs		1887-1891
Robert J. Reynolds		1891-1895
Joshua H. Marvel	Republican	1895
William T. Watson, acting	Democrat	1895-1897
Ebe W. Tunnell		1897-1901
John Hunn	Republican	1901-1905
Preston Lea		1905-1909
Simeon S. Pennewill		1909-1913
Charles R. Miller		1913-1917
John G. Townsend, Jr.		1917-1921
William D. Denney		1921-1925
Robert P. Robinson		1925-1929
C. Douglas Buck		1929-1937
R. C. McMullen	Democrat	1937-1941
Walter W. Bacon	Republican	1941-1949
Elbert N. Carvel	Democrat	1949-1953
James Caleb Boggs	Republican	1953-

Legislature.—The General Assembly, consisting of a House of Representatives and a Senate, meets in odd-numbered years in a legally unlimited session or at the call of the governor. There are 35 representatives (15 from New Castle County and 10 each from Kent and Sussex counties) elected for two years, and 17 senators (7 from New Castle County and 5 each from Kent and Sussex counties) elected for four years.

Courts.—Until the mid-20th century the judicial system of Delaware very closely resembled the early English court system introduced in the colonial period. However, in 1951 a constitutional amendment reorganized the court structure to provide, for the first time, a separate Supreme Court, justices of which are appointed by the governor to 12-year terms. The state's higher judiciary now comprises the three Supreme Court justices and six other state judges, the latter including a chancellor, a president-judge, and four associate judges of the Superior and Orphans' Court. Under the judicial reorganization, three separately existing courts—the Superior Court, the Court of Oyer and Terminer, and the Court of General Sessions—were consolidated into the single Superior Court. Lower courts include the courts of common pleas, the family court, juvenile courts, and municipal courts, from which appeals may be made to the proper higher courts. Civil and criminal offenses not in excess of \$500 may come before the justices of the peace or magistrates appointed by the governor.

Suffrage and Elections.—All citizens 21 years of age and older, resident in the state for one year, in the county for three months, and in the district for 30 days, may vote in Delaware. Registration is permanent, and absentee voting is permitted. Voting machines are not in use.

Local Government.—The counties, cities, and towns derive their authority from acts passed by the legislature. The duties and powers of each municipality are set forth in their charters, which may be amended by the state legislature.

Public Health and Welfare.—Except for those cities which have their own boards of health, public health in Delaware is under the supervision of the state board of health. The statewide health program centers in the county health units, which are under the full-time direction of competent health officers. By operat-

ing at the county level, it is possible to attend immediately to the control of communicable diseases and to provide prenatal, postpartum, maternal, and child health instruction. Through dental hygienists and the county health officers, school children are given periodic examinations, and a mobile X-ray unit is used in examining children and adults for tuberculosis. State welfare agencies include the state commission for the blind, the Delaware State Hospital and Commission for the Feeble Minded, the old age welfare commission, and the state board of welfare. There are three reformatories—the Ferris School for Boys, the Kruse School (Negro girls), and the Woods Haven School for Girls—but no state prison. Short-term prisoners are kept in the county jails, and long-term prisoners are sent to the New Castle County Jail.

The first workmen's compensation act was passed in 1917, and a new law was enacted in 1941. Compensation is administered by the industrial accident board. The state unemployment compensation commission provides unemployment benefits. Both the state and the city of Wilmington have pension systems, and an independent board administers pensions for the state police.

Education.—Delaware provided free public education by state law in 1829, being among the first of the states to do so. School attendance is generally required for children between the ages of 7 and 14, inclusive, but is extended to the age of 16 for those children who have not completed the eighth grade. Public education administered by the state board of education through three different groups: the schools of the city of Wilmington, which are autonomous; the 15 special school districts in the larger towns, which are supervised; and the 123 school districts fully administered by the state board. Beginning in the 1920's, small rural schools have been closed through consolidation with the larger schools. Children are provided free transportation to the consolidated schools. The state constitution provides that separate schools be maintained for white and Negro children.

A school building program begun in 1919 has provided Delaware with about 160 new schools. Of approximately \$22,000,000 spent for new buildings, the state provided \$12,775,000. The remainder was obtained from local districts, federal funds, district bond issues, and individual donors. By 1948 the value of school property per pupil enrolled was \$475, and in 1950-1951 the average expenditure from all sources per pupil in average daily attendance was \$280.65. In 1952-1953, elementary school departments had 33,593 pupils; secondary departments, 19,131 students. Salaries for elementary school teachers in 1952-1953 averaged \$3,996; for secondary school teachers, \$4,251.

The University of Delaware (q.v.) at Newark was chartered in 1833 as Newark College. Governed by its own board of trustees, it is supported by the state except for federal funds to which it is entitled as a land-grant college. An experimental farm supplements class work in agriculture and provides helpful information to the farmers of the state. Delaware State College, near Dover, provides courses in the arts and sciences, education, and agriculture for Negro students.

In addition to public schools there are four private and more than a dozen parochial schools

in the Wilmington area. Other private schools are Wesley Junior College at Dover and King's College near Delaware City.

Libraries and Museums.—Wilmington and all the larger cities and towns of the state enjoy good library facilities. The Wilmington Institute Free Library is well housed and contains about 200,000 volumes. Working with it is the New Castle County Library, which supplies books to lending stations in rural areas of the county. The book trucks of the state library commission supplement the work of the town and school libraries in Kent and Sussex counties. Among other cultural centers in the state are the Delaware Art Center, the Historical Society of Delaware, and the Natural History Society, in Wilmington; the Memorial Library of the University of Delaware at Newark, the Amstel Museum at New Castle; the State Archives Commission and the State Library at Dover; and the Zwaanendael Museum at Lewes.

History.—Delaware Bay and River were explored by the Spaniards and Portuguese in the 16th century, by Henry Hudson in 1609, by Sir Samuel Argall in 1610, by Cornelis Mey in 1613, and by Cornelis Hendricksen in 1614. On the basis of Hudson's exploration and those of Mey and Hendricksen, the Dutch planned their settlements in this area. A group in the Netherlands, headed by Capt. David Pietersen De Vries, formed a trading company which effected a settlement at Zwaanendael (now Lewes) in 1631 under the leadership of Capt. Pieter Heyes. Unfortunately trouble with the Indians resulted in the massacre of all the settlers and the end of the venture.

No other attempt at colonization was undertaken in the Delaware area until 1638, when two ships, the *Kalmar Nyckel* and the *Fogel Grip*, brought an expedition from Sweden under the leadership of Capt. Peter Minuit. The expedition, sent with the expectation of increasing the commerce of Sweden, reached Delaware about March 29. The Swedes landed on a natural wharf of rocks beside a river which they named in honor of their ruler, Queen Christina. The settlement which grew there (now Wilmington) was named Christinahamn, also in her honor. Shortly after the landing, Captain Minuit met with the neighboring Indians and purchased land from them. Through subsequent purchases the boundaries of New Sweden were extended from the falls at Trenton to below Cape Henlopen on the west side of the Delaware River, and on the east side to include a large portion of what is now New Jersey. Following expeditions brought more settlers, livestock, and other supplies from Sweden, and, with the arrival of clergymen, churches and schools were established.

For a time trade with the Indians for beaver pelts and other furs flourished, but lack of supplies soon hindered the Swedes, who lost much of their trade to the Dutch, established farther up the Delaware River. Then began a struggle between the Dutch and the Swedes for control of the river and the rich Indian trade. Under aggressive governors like Peter Hollandaer and Johan Printz the colony of New Sweden expanded and fortifications and roads were built. The Dutch, meanwhile, were not idle. They left their old trading post and, moving farther down the Delaware River, established a settlement in 1651 at Fort Casimir (now New Castle), which gave them control of the river traffic and the

Indian trade as well. In 1654, there arrived from Sweden a new governor, Johan Classon Rising, who, upon being challenged by the Dutch at Fort Casimir, seized the fort and renamed it Fort Trinity. The Dutch were not to remain passive under this defeat, for in 1655, Governor Peter Stuyvesant sent a small fleet as well as an expedition overland from New Amsterdam to recapture the fort. Without great effort, Fort Casimir was recaptured and all of New Sweden capitulated to the Dutch. Although Swedish colonial authority was thereby terminated, the colonists remained and continued spreading their cultural, religious, and social influence throughout the area. The log cabin, which they introduced into North America, became the pioneer habitation which spread throughout the country.

Under the Dutch, the seat of government was established at Fort Casimir and the nearby town of New Amstel. A vigorous trade was carried on with the Indians, and the colony, included with the others of New Netherlands, grew with the addition of new colonists. Dutch industry manifested itself in orderly gardens and small farms, neat buildings, roads and bridges, and dikes along the marshy areas. Unfortunately, the colony was not long to endure as the war waged by the Dutch and English abroad was brought to the New World and resulted in the capture of New Amsterdam, New Amstel, and the other Dutch possessions in 1664 by an expedition under James, duke of York.

Deputy governors sent from New York did not greatly change conditions on the Delaware River. The Swedish and Dutch colonists, by swearing allegiance to the king of England, retained their lands, and their life continued much as before. The notable contribution of this regime was the introduction in 1673 of the duke of York's *Book of Laws* and the English legal system. This same period saw the development of the three Delaware counties. In 1680, the Dutch judicial districts of New Castle and Hoerenkil surrendered some of their territory for the creation of St. Jones County, and at the same time Hoerenkil was renamed Deale.

The next year, 1681, brought other settlers to the Delaware River. King Charles II had granted to William Penn the territory to the north of the duke of York's colony on the west side of the river. Penn's agents soon found that the Province of Pennsylvania would be landlocked if those controlling the land on both sides of the Delaware became hostile. The proprietor of this new province therefore petitioned the crown for the land below his province on the west side of the Delaware River and Bay. In August 1682, by a series of deeds and leases which are exhibited in the Delaware State Archives at Dover, the duke of York conveyed the counties of New Castle, St. Jones, and Deale to William Penn. In October of the same year the proprietor first landed in America at New Castle and there on the 27th took possession of the Lower Counties from the duke of York's agents. At the same time the colonists acknowledged Penn as their ruler by swearing allegiance to him. In December, the three Lower Counties were formally annexed to the Province of Pennsylvania, and shortly thereafter Penn renamed the counties of St. Jones and Deale, Kent and Sussex, respectively.

Penn's "Frame of Government" gave many ad-

vantages to the colonists of the Province of Pennsylvania and to those of the Lower Counties as well, and both prospered for a time. Soon, however, events occurred which interfered with the development of the three Lower Counties. Lord Baltimore's agents notified Penn and his officials that they were trespassing on Maryland territory, and for years the Delaware counties were harassed by armed attacks, the confiscation of property, and taxation by both Maryland and Pennsylvania collectors. The dispute was finally settled in favor of the Penn heirs nearly a century later. (See Mason and Dixon line.) Unrest and trouble did not end in the Lower Counties with this episode. The series of nearly continual wars in Europe between 1689 and 1763 had their counterparts in the American colonies, and the unprotected towns and plantations along the lower Delaware fell an easy prey to Spanish and French privateersmen during these conflicts. Pleas for armed assistance were not heeded by the Quakers in authority at Philadelphia. As a result, the Delaware counties organized their own militia to fight off the raiders, and, incidentally, served as a buffer against the enemy for those farther up the river. Disgruntled by the lack of military or financial aid during these depredations, and by the inattention to legislation pertaining to the Lower Counties in the provincial assembly, the colonists petitioned for and obtained their own assembly in 1704, which thereafter met in the courthouse in New Castle.

Despite these unfavorable conditions, the towns of Lewes, Dover, Duck Creek, New Castle, and Wilmington expanded, largely by raising and shipping food for consumption in the West Indies, Europe, and the Southern colonies. In 1765, shortly after the French and Indian War, impending trouble with the mother country developed. The three Lower Counties sent Jacob Kollock, Caesar Rodney, and Thomas McKean to New York as delegates to the Stamp Act Congress to protest against this unpopular tax. Rodney and McKean, with the addition of George Read, also represented the Delaware counties in the Continental Congress and in all important events leading up to the revolution. These three were signers of the Declaration of Independence for Delaware, and it was on this occasion that Rodney made his famous ride from Dover to Philadelphia on July 2, 1776, to break Delaware's deadlocked vote on Richard Henry Lee's resolution favoring independence.

Events moved swiftly in the new state following the Declaration of Independence. Because Delaware had participated for many years in the colonial wars and had a well-organized militia, a number of excellent officers were available and some of the militia units were ready to march. The first regiment, 800 men, under Col. John Haslet, took part in the battles of Long Island and White Plains. At the same time, a constitution was adopted at New Castle, then the capital, and preparations were rushed for the defense of the state. Delaware troops served with Washington all through the campaign in New Jersey, and when the British under Gen. Sir William Howe landed with 18,000 men at the head of the Elk River in the fall of 1777, they rushed to protect their own homes. Instead of attacking the main American entrenchments defending Wilmington, Howe's forces marched westward through Newark and then on to cross the Brandywine River at Chadd's Ford. A heavy

skirmish took place at Cooch's Bridge on September 3. Later, on September 13, British forces returned to Wilmington at night, capturing President John McKinly and many of the state's records. The capital was hastily transferred to Dover, and Caesar Rodney became president in 1778. Fighting shifted to the southern states where Delaware troops, though suffering great losses, distinguished themselves in all important engagements through Yorktown.

After the war, trade and industry in the state rapidly revived. In 1785, Oliver Evans, of Newport, Del., invented flour milling machinery that revolutionized the industry, and by 1790 the mills along the Brandywine in Wilmington alone were shipping 300,000 bushels of flour. In 1786, saw the meeting of the Annapolis Convention under the leadership of John Dickinson of Delaware. This convention was the forerunner of the Constitutional Convention which met in Philadelphia in 1787. On December 7, 1787, Delaware became the first state of the Union by being the first to ratify the Constitution. When the first federal census was taken in 1790, Delaware had a population of 59,096. Two years later a new state constitution was framed under the guidance of John Dickinson, which provided a governmental structure much like the present one. The incorporation of the Bank of Delaware in 1795, the establishment of the powder mills on the Brandywine by E. I. Du Pont in 1802, the beginning of the Delaware and Chesapeake Canal in 1804, and the increase in population to 72,674 by 1810 were all indications of prosperity and growth. These were soon overshadowed by war with Great Britain in 1812. The state quickly prepared to defend its long shoreline. Early in the war, British ships threatened action against Delaware territory but none took place until the bombardment of Lewes on April 6, 1813. Two Delawareans, Jacob Jones and Thomas Macdonough, emerged as naval heroes of the war. Another Delawarean, James A. Bayard, was one of the commissioners who negotiated the Treaty of Ghent with Great Britain in 1814.

Recovery in the state following this war was even quicker than following the revolution. Steamboats were replacing sailing vessels on the Delaware River as early as 1816 and, although stagecoaches were still in use for overland travel, the trips were more frequent. By 1829 the Delaware and Chesapeake Canal was opened, and two years later the New Castle and Frenchtown Railroad began operation, facilitating travel from the Delaware River to the head of Chesapeake Bay. Advances were made not only in transportation but in all phases of daily life. Free public schools were established in 1829, and Newark College (now the University of Delaware) was chartered in 1833; the third constitution of the state was adopted in 1831; and the next year Wilmington changed from borough status to that of a city.

Although Delaware suffered from the depression of 1837, her banks were able to weather the crisis and progress continued. When Zachary Taylor became president in 1849, he selected John M. Clayton of Delaware as secretary of state, and it was during his term of office that the Clayton-Bulwer Treaty (q.v.) was negotiated with Great Britain. Meanwhile, Delaware's peach orchards had earned for it the name of "Peach State." The completion of the Delaware Railroad to the Maryland line in 1859

opened the rich agricultural areas of the state to further development. It was also a great aid to the Union cause in the Civil War. Although a slave state with many Confederate sympathizers, Delaware remained in the Union, and from her small population of 112,216 (1860), she furnished between 13,000 and 14,000 troops to the Union Army. In addition to heavy losses in men, a large state debt was incurred which handicapped development for many years. With the adoption of a new constitution modernizing the government (1897), the improvement in agricultural methods, and the increased industrialization of the Wilmington area, the state made great progress in the 20th century. Health and welfare legislation was enacted, roads were built, and the school system was modernized. In World War I and II the people of Delaware contributed heavily in men and in materials of all kinds, ranging from heavy landing craft to nylon parachutes.

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LEON DE VALINGER, JR.,
State Archivist.

DELAWARE, city, Ohio, seat of Delaware County, located almost at the exact center of the state, 24 miles north of Columbus, on the Olentangy River, the Chesapeake and Ohio, New York Central, and Pennsylvania railroads, and state and federal highways. Quarrying is an important activity, and there are factories producing canvasses, sucker rods, stoves, machine screws, rubber goods, and tool handles. The city has a public library and a hospital, and is the seat of Ohio Wesleyan University (q.v.). It was the birthplace of President Rutherford B. Hayes, Oct. 4, 1822. Pop. (1950) 11,804.

DELAWARE, University of, at Newark, Del., traces its origin to an academy founded in 1743. As a degree-granting institution it dates back to Newark College (later Delaware College), established in 1833. It has been a land grant college since 1870. The Women's College was founded in 1914, and in 1921 that college and Delaware College (for men) were joined in a coordinate university. In 1944, the colleges were abolished in favor of complete coeducation.

Following World War I the university was enlarged through increased state appropriations and the benefactions of private citizens, notably P. S. du Pont, H. Rodney Sharp, R. R. M. Carpenter, and H. Fletcher Brown. There are five academic schools—arts and science, agriculture, education, engineering, and home economics—as well as the divisions of academic extension, summer session, and graduate study. In 1948, the first Ph.D. degrees were granted. By 1953, undergraduate enrollment was 1,877 and the full-time faculty numbered 210. Endowment exceeded \$8 million and the library contained nearly 200,000 volumes. The campus comprises 86 acres with about 25 buildings. In addition, there are

two university-operated farms in conjunction with the agricultural extension service and experimental station.

WILLIAM S. CARLSON, *President*.

DELAWARE AND HUDSON RAILROAD. The Delaware and Hudson railway system is the outcome of a series of amalgamations of many small lines leased and constructed by the Delaware and Hudson Canal Company, which was chartered under the laws of the State of New York in 1823 as a coal mining and transportation company. The state also lent \$500,000 to aid in the construction of a canal from Honesdale, Pa., across the Delaware River to Rondout, (now a part of Kingston), N. Y. on the Hudson River—hence the name "Delaware and Hudson." The canal was completed in 1828 and was capable of accommodating boats carrying 25 tons. It was enlarged in 1844 for 40-ton boats, and again in 1862 for boats of 125 to 150 tons' capacity. It was finally abandoned in 1898, with the consent of the State, and the name of the corporation was changed to the Delaware and Hudson Company.

The rail lines of the Delaware and Hudson Company extend from Wilkes-Barre, Pa., to Rouses Point on the Canadian border, with branches to Binghamton and Troy, N. Y., Rutland, Vt., Lake George and Lake Placid, N. Y., and some lesser points. In the number and variety of its summer resorts, the railroad occupies a unique position, touching Cooperstown, Sharon Springs, Round Lake, Saratoga Springs, the Lake George and Lake Champlain resorts, and the eastern gateways to the Adirondack Mountains.

On April 1, 1930, the Delaware and Hudson Company transferred its railroad properties in the United States to the Delaware and Hudson Railroad Corporation, receiving in return the latter's entire capital stock and thereby assuming the status of a holding company. Its principal other interests are the Delaware and Hudson Coal Company, which owns and operates a number of anthracite coal mines between Wilkes-Barre and Carbondale, Pa.; the Napierville Junction Railway Company, a Canadian property; and the Greenwich & Johnsonville Railway Company. As of Dec. 31, 1953, the company operated a total road mileage of 793, of which it owned 646 miles, leased 56 miles, and operated 91 miles under trackage rights. In 1953, the coal company mined 2,481,722 net tons of anthracite, as compared with 5,105,408 in 1947, or 9.04 per cent of the total United States production.

At the end of 1953, total assets of the Delaware and Hudson Company were valued at \$201,071,179. Capital stock totaled \$53,964,900, and long-term debt, \$67,798,347. In 1953, total operating revenues were \$85,923,917, of which \$56,561,838 was derived from transportation. Total expenses amounted to \$69,363,459. Net income was \$5,533,840.

The Delaware and Hudson Railroad Corporation had operating revenues totaling \$55,256,873 in 1953, of which \$51,518,584 was derived from freight, and \$1,916,668 from passengers. Operating expenses totaled \$41,834,044: transportation accounting for \$19,337,052; maintenance of equipment, \$9,813,728; and maintenance of way, \$9,194,608. Net railway operating income aggregated \$10,419,525; net income, \$6,382,333.

DELAWARE INDIANS, an important Algonquian tribe which occupied the entire basin of the Delaware River in colonial times, spreading over eastern Pennsylvania, southeastern New York, and the greater part of New Jersey and Delaware. Called "grandfathers" by other Algonquians, their own name for their tribe was Leni-Lenape, meaning "real men." They were divided into three large clans: the Unalachtigo, or Turkey, who lived on both sides of Delaware Bay; the Unami, or Turtle, who occupied the middle Delaware Valley; and the Munsee, or Wolf, who lived along the upper Delaware in New York, New Jersey, and Pennsylvania. Except for the massacre of the Dutch colony at Zwaanendael (now Lewes, Del.) in 1631, early relations between the Delaware and the white settlers in Delaware and Pennsylvania were good. The Swedes who came to Delaware in 1638 upheld Indian titles to the land to secure their own possession against the Dutch, and the treaty which William Penn made with the Indians of Pennsylvania in 1682 was well kept during his lifetime and enforced, despite encroachments, by his successors through appeals to the Iroquois, to whom the Delaware owed allegiance. The influence of the Iroquois was invoked by the Pennsylvania government to compel the Delaware to accept the trick of the Walking Purchase (q.v.), which deprived them of half a million acres in the forks of the Delaware above Easton. As early as 1720 and continuing until after the French and Indian War, the Delaware moved westward, first to the upper Susquehanna Valley, and then to Ohio, where many of them settled in the Muskingum Valley. A number were converted to Christianity by Moravian missionaries. Others, alarmed at the spreading tide of white settlement, joined with the French in the French and Indian War and supported Pontiac (q.v.) in 1763. Defeated by Col. Henry Bouquet at Bushy Run in 1763, they made peace in 1764-1765. A few remained hostile until 1774, when they were defeated at Point Pleasant. During the American Revolution some of the Delaware joined the British; the others, who had made a treaty with the Continental Congress in 1775, were neutral until 1781. Meanwhile, the Christian Delaware remained quietly in their villages along the Muskingum River until the massacre at Gnadenhütten (q.v.), when most of the survivors went to Canada. The other Delaware continued hostile until Gen. Anthony Wayne forced them to make peace in 1795. Successive treaties removed them from Ohio, and by 1800 the main body of the Delaware were in Indiana. In 1819 they ceded all their lands east of the Mississippi and moved to White River, Missouri. There were then about 1,800 in all, a few remaining in Ohio. Later, some went south to the Red River, by Spanish permission. The rest, numbering about 1,000, settled on the Kansas and Missouri rivers, where they had schools and missions. In 1853, they sold most of their tribal land and invested the proceeds in houses and farms. When their remaining land was cut by the Union Pacific Railroad, they sold it (1867-1868) and bought new lands on the Verdigris and Caney rivers from the Cherokee. A special treaty of 1866 permitted them to take lands in severalty and become citizens. In 1930, the Bureau of the Census reported that the great majority of the remaining Delaware were living in Oklahoma.

Their number was then estimated as 971, only 20.2 per cent of whom were full bloods. As of Jan. 1, 1945, 165 of the Delaware were living under Kiowa jurisdiction on the Wichita Reservation in Oklahoma. In September 1948, the Canadian Department of Mines and Resources reported that there were 333 Moravian Delaware living in Highgate, Ontario. Consult D. G. Brinton, *The Lenape and Their Legends* (Philadelphia 1885); M. R. Harrington, *A Preliminary Sketch of the Lenape Culture* (Lancaster, Pa., 1913); V. Kinietz, *Delaware Culture Chronology* (Indianapolis 1946).

DELAWARE, LACKAWANNA AND WESTERN RAILROAD COMPANY, The, was chartered under the laws of Pennsylvania in 1849 as the Ligetts Gap Railroad, extending west from Scranton, Pa., to a connection with the Erie Railroad at Great Bend, Pa., for the purpose of transporting anthracite coal. The name was changed in 1851 to Lackawanna and Western Railroad. The Delaware and Cobbs Gap Railroad, chartered to be built from Scranton east to the Delaware River, was consolidated with the Lackawanna and Western in 1853, and the present name then adopted. Later, the parent company leased the Warren and the Morris and Essex railroads, thereby effecting entrance to New York Harbor at Hoboken, N. J. The company then constructed a new line from Hallstead, Pa., to Binghamton, N. Y., and leased one line from Binghamton to Utica, N. Y., and two lines from Binghamton through Syracuse to Oswego on Lake Ontario. In 1882 it built and operated as a leased line a railroad from Binghamton, N. Y., to Buffalo, N. Y. Until 1944, Delaware, Lackawanna and Western comprised only the lines in Pennsylvania, all other parts of the system being leased lines. From 1944 to 1947, however, all the leased lines were acquired by merger, so that by Dec. 31, 1947, the entire line was owned by the Delaware, Lackawanna and Western Railroad Company.

The present Lackawanna Railroad, as it is popularly called, includes as its oldest component the line from Owego to Ithaca, N. Y., chartered in 1828 and completed in 1834. For six years this road was operated by horsepower and stationary engines, the company having no locomotives until 1840. The Lackawanna is the shortest line between Buffalo and New York, with a mileage of 395. It is famous as "The Road of Anthracite" and "The Route of Phoebe Snow." An interesting incident in its early history relates to the efforts of the railroad to induce the public to use anthracite coal as fuel by giving it away in the 1850's to those who would try it.

The system extends from seaboard at New York to the Great Lakes at Buffalo, crossing New Jersey, Pennsylvania, and southern and western New York, with branches into the slate, cement, and anthracite coal regions of Pennsylvania and the agricultural, dairy, and industrial area of central New York. The total mileage operated on Dec. 31, 1947 was 972.68. As of December 1947, the investment in road and equipment was \$318,777,177, and its depreciated value, \$249,801,268. Equipment consisted of 310 locomotives, 711 passenger cars, 16,785 freight cars, and 177 pieces of floating equipment. Total capitalization was \$220,534,146, as follows: 1,688,824 shares of capital stock of \$50 par value, outstanding in amount of \$84,441,200; long-term debt outstand-

ing, \$120,564,500; equipment obligations outstanding, \$15,528,446.

The company formerly owned extensive anthracite coal lands in Pennsylvania, estimated to contain 400,000,000 tons of unmined coal, but legislation prohibited a railroad from transporting over its lines commodities in which it had a direct or indirect interest, and in 1921, the stockholders approved sale of the coal properties to the Glen Alden Coal Company for \$60,000,000. The railroad owns and operates the Hoboken Ferry Company, connecting Hoboken, N. J., with New York.

WILLIAM WHITE,
President

DELAWARE RIVER, a major river of the eastern United States. The main fork, called the west branch, rises on the slopes of the Catskill Mountains in Schoharie County, N. Y., at an elevation of almost 1,900 feet. This branch takes a southwestern course to Deposit, whence it flows southeast and becomes the boundary line between the states of New York and Pennsylvania. The lesser fork, called the east branch, also rises in the Catskills and flows into the main branch at Hancock. After leaving Port Jervis, N. Y., the river divides the states of New Jersey and Pennsylvania, flowing in a southerly direction through Delaware Water Gap (q.v.) to Easton, Pa. Its course is now southeast to Trenton, N. J., whence it turns southwest and flows past the cities of Camden, N. J., and Philadelphia and Chester, Pa. Below Chester it gradually widens past Wilmington, Del., into Delaware Bay. Its extreme length, including the bay and estuary, is approximately 410 miles. The bay itself has a maximum width of 27 miles. At the entrance, between Cape May, N. J., and Cape Henlopen, Del., it is 13 miles wide.

The total area of the watershed of the Delaware River is 12,012 square miles, of which 3,000 miles are in New York, 2,500 in New Jersey, and more than 6,000 in Pennsylvania. In New York it receives the waters of the Mongaup and Neversink rivers, in New Jersey of the Musconetcong and Maurice, and in Pennsylvania of the Lackawaxen, Lehigh, and Schuylkill. Ocean-going vessels can ascend the Delaware to Philadelphia, and vessels of lighter draught to Trenton. From Easton to a point opposite Trenton its course is paralleled by a canal. Another canal links it with the Raritan River at New Brunswick, N. J. A toll-free, sea-level canal, carrying thousands of tons of freight each month, connects Delaware and Chesapeake bays. The entrance to Delaware Bay at Cape Henlopen is protected by a heavy granite breakwater, 2,800 feet long, which affords safe anchorage to vessels within the cape. The anchorage covers an area of 300 acres and has a depth of 24 feet. Government lighthouses are stationed at the entrance to indicate shoal places in the channel and breakers along the shore.

Along the course of the river are considerable waterfalls which are used for power. Among them are Welles's Falls at Lambertville, about 15 feet; the Foul Rift of 23 feet at Belvidere; and the 30-foot fall at Port Jervis.

The Delaware River was first explored in 1609 by Henry Hudson and in 1614 by Cornelis Hendricksen. The reports of these and other navigators led to the establishment of the Dutch West India Company, and to the founding of

the Dutch and Swedish colonies on the Delaware. See also DELAWARE.

DELAWARE WATER GAP, borough, Pennsylvania, in Monroe County, on the Delaware River and the Delaware, Lackawanna and Western Railroad, east of Stroudsburg, Pa. The borough is named for a gorge, two miles in length, formed by the passage of the Delaware River through the Kittatinny Mountains, which rise on either side to a height of 1,500 feet. Its great scenic beauty attracts many tourists and vacationists. Pop. (1940) 410; (1950) 734.

DELAWARE, 3d OR 12TH BARON, THOMAS WEST (KNOWN AS LORD DELAWARE). See DE LA WARR, THOMAS WEST, 3d OR 12TH BARON.

DELBRÜCK, dël'brük, Hans, German historian: b. Bergen, Rügen, Nov. 11, 1848; d. Berlin, July 14, 1929. He was educated at Heidelberg, Bonn, and Greifswald; served as an officer in the Franco-Prussian War; and was tutor to Prince Waldemar of Prussia from 1874 to 1879. He was a member of the Prussian Diet from 1882 to 1885, and of the Reichstag from 1884 to 1890. From 1883 he was on the editorial staff of the *Preussische Jahrbücher*, and in 1885 he became professor of modern history at the University of Berlin. Delbrück's historical works, which deal chiefly with the art of war, include *Die Perserkriege und die Burgunderkriege* (1886); *Friedrich, Napoleon, Moltke* (1892); *Krieg und Politik* (1919); *Geschichte der Kriegskunst im Rahmen der Politischen Geschichte* (1900-1927).

DELBRÜCK, Rudolf von, German statesman: b. Berlin, April 16, 1817; d. there Feb. 1, 1903. He was educated at Halle, Bonn, and Berlin and entered the Prussian ministry of commerce in 1848, where he worked to further the extension of the Zollverein (q.v.) to all the German states. Delbrück was an advocate of free trade, and with Bismarck's support he negotiated trade treaties with foreign countries. In 1867 he became president of the chancellery of the North German Confederation, and in 1870 aided in negotiating the treaties which made Germany a unit. For five years after the founding of the empire, he retained his office as president of the chancellery, now the Imperial chancellery. When Bismarck turned toward protectionism, Delbrück resigned his office, in 1876. He endeavored unsuccessfully to prevent the adoption of a higher tariff in 1879 and retired from the Reichstag two years later. In 1896 he was decorated by the emperor with the order of the Black Eagle.

DELCASSE, dël-kà-sä', Théophile, French statesman: b. Pamiers, Ariège, France, March 1, 1852; d. Nice, Feb. 22, 1923. After serving on the staff of *La République Française*, he was elected deputy from Foix in 1889 and re-elected in 1893 and 1898. He became under-secretary of state for colonies in 1893, and minister of colonies in 1894. In 1898, Delcassé was made minister of foreign affairs, a post he retained for seven years in the cabinets of Brisson, Dupuy, Waldeck-Rousseau, Combes, and Rouvier. He settled the Fashoda Affair with Great Britain, thereby dividing French and British spheres in Africa (1899). He also con-

cluded a commercial convention with the United States. Disapproval of his policy in the Moroccan dispute with Germany forced him out of office in 1905. As chairman of the marine commission in 1909 he brought about Georges Clemenceau's resignation on a naval question. From 1911 to 1913 he was minister of marine in three successive cabinets. In 1913 he was sent to St. Petersburg (now Leningrad) as ambassador to bolster the deteriorating Franco-Russian alliance. When World War I broke out he again became minister of foreign affairs in René Viviani's war cabinet. He helped bring Italy into the Allied camp but his unsuccessful Balkan policy brought about his retirement in 1915. Though his last tenure in office was virtually a failure, Delcassé was the outstanding diplomatic figure of the Third French Republic. To him belongs most of the credit for the Anglo-French Entente Cordiale of 1904 and the succeeding Triple Entente of 1907.

Consult Reynald, G., *La diplomatie française l'oeuvre de M. Delcassé* (Paris 1915); Blanc, E., *La Jeunesse de Delcassé* (Paris 1934); Porter, Charles W., *The Career of Théophile Delcassé* (Philadelphia 1936).

DELEDDA, dā-lēd'dā, **Grazia**, Italian author: b. Nuoro, Sardinia, Sept. 27, 1875; d. Rome, Aug. 16, 1936. She had little formal education, but she read widely and she was a born narrator. Grazia Deledda was contributing short stories and articles to magazines in Sardinia and Rome before she was 18; by the time she was 21 she had published three books of Sardinian life—*Fior di Sardegna* (*Flower of Sardinia*, 1891), *Racconti sardi* (*Sardinian Tales*, 1894), and *Anime oneste* (*Honest Souls*, 1895). In 1897 she married Palmerino Madesani, a civil servant, and she soon left Sardinia to go with him to Rome, but the surroundings of her youth and the stark, passionate lives of Sardinian peasants, rural aristocrats, and mountaineers remained with her always.

She lived a quiet life at Rome, devoting herself to her family and her writing. A growing intensity of characterization and less dependence on the purely picturesque is evident in the series of novels that included *Dopo il divorzio* (*After the Divorce*, 1902) and culminated in *Elias Portolu* (1903), which made her reputation in Italy and was widely translated abroad.

Other novels followed, in which a keen psychological insight goes hand in hand with local color, and the characterization is broadened, becoming universal rather than regional. *Cenere* (*Ashes*, 1904), *La via del male* (*The Path of Evil*, 1906), *Canne al vento* (*Reeds in the Wind*, 1913), and *L'incendio nell'oliveto* (*Fire in the Olive Grove*, 1918) are members of this group, narrated in her partly lyrical, partly realistic style. Her realism, however, is not naturalism, relieved as it is by scenes of great emotional intensity, and her novels and stories can only superficially be compared to those of another regionalist, the Sicilian naturalist Giovanni Verga. *L'edera* (*The Ivy*, 1906) and *La madre* (*The Mother*, 1920), simply told tragedies of ordinary life, are considered her finest achievements.

In 1926, Grazia Deledda became internationally famous when she was awarded the Nobel Prize for Literature. Her last novels, such as *La fuga in Egitto* (*Flight into Egypt*, 1925) and *Il paese del vento* (*Land of the Wind*, 1931), are marked by a deliberate abandonment of the Sardinian locale.

DE LEE, dē lē', **Joseph Bolivar**, American obstetrician: b. Cold Springs, N. Y., Oct. 28, 1869; d. Chicago, Illinois, April 2, 1942. A pioneer in obtaining free medical care for needy mothers, he founded the Chicago Lying-in Hospital and Dispensary (1895) and the Chicago Maternity Center (1932). He also held professorships at Northwestern University (1897-1929) and at the University of Chicago (1929-1935). His publications include *Obstetrics for Nurses* (1904; 12th ed. 1941), *Yearbook of Obstetrics* (1904-1941), and *Practice of Obstetrics* (1913; 7th ed., 1938).

DELEGATION, strictly speaking, the process of transferring power or authority to one or more persons who act on behalf of others, usually a larger political body. Often this delegated power is subject to prescribed qualifications and judicial review. For example, the United States Congress may create special government agencies, such as the National Labor Relations Board, to carry out prescribed governmental functions. Members are appointed by the president with senatorial confirmation. They are independent of executive control but subject to Federal jurisdiction. In Great Britain, Parliament delegates legislative authority to cabinet ministers who are directly responsible to Parliament itself.

In a broader sense, the term delegation also applies to one or more persons commissioned to represent the views of others, usually at conventions or international councils.

Historically, in Lombardy, Venice and the Papal States, the term *delegazione* was applied to the governor and governing council of a province and to the province itself. The pope delegated power to papal delegates who always were prelates.

DE LEON, dē lē'ōn, **Daniel**, American socialist leader: b. Curaçao, Netherlands Antilles, Dec. 14, 1852; d. New York, N. Y., May 11, 1914. The son of a surgeon in the Dutch colonial army, he studied in Germany and the Netherlands before settling in New York City in his early twenties. He received a law degree from Columbia College (now University) in 1878 and later won a prize lectureship there on Latin American diplomacy (1883-1889). Deeply interested in social reform and labor, De Leon joined the Knights of Labor (1888), author Edward Bellamy's Nationalist movement (1889) and the Socialist Labor Party (1890). In 1892 he became editor of the Socialist Labor weekly, *The People*.

An advocate of Socialist industrial trade unions, De Leon led a group out of the Knights of Labor in 1895 to organize the Socialist Labor and Trade Alliance. An opposing faction, accusing him of being doctrinaire, withdrew in 1899 with a majority of the membership to ultimately form the Socialist Party of America. De Leon merged his weakened Alliance with the Industrial Workers of the World (IWW) when it was formed in 1905. When he was expelled from the IWW in 1908 his followers formed a rival Workers International Industrial Union which was largely unsuccessful.

A controversial figure, he has been called the most important intellectual exponent of Marxism. Lenin said his writings presented the theoretical basis of the Soviet system. He wrote propaganda pamphlets such as *What Means This Strike* (1898) and *Two Pages from Roman His-*

tory (1903). His translations included one of Karl Marx's works, *The Eighteenth Brumaire of Louis Napoleon*.

DELESCLUZE, dē-lā-klüz', **Louis Charles**, French journalist and leader of the Paris Commune (1871): b. Dreux, France, Oct. 2, 1809; d. Paris, May 25, 1871. A radical republican, his career was punctuated with revolutionary agitation, radical journalism, imprisonment and exile. He took active part in the insurrections of 1830 and 1848. Later in Paris he attacked growing government conservatism in his journal *La Révolution Démocratique et Sociale*. In 1853 he was deported to a convict plantation in Cayenne, French Guiana for his bitter criticism of the Second Empire. He returned to France in 1859 and later published *De Paris à Cayenne, journal d'un transporté* (1869, Eng. tr., 1872). When the Second Empire fell, he was elected to the National Assembly and also to the Paris Commune in 1871. Choosing to sit with the latter, he took over the war ministry and led the final attack against the government. When defeat was inevitable he deliberately threw himself into the line of fire on one of the last barricades where he was killed on May 25, 1871.

DE LESSEPS, VICOMTE **Ferdinand Marie**. See LESSEPS, FERDINAND MARIE DE.

DELESSERT, dē-lě-sār', **BARON Benjamin**, French industrialist, financier, and philanthropist: b. Lyon, France, Feb. 14, 1773; d. Paris, March 1, 1847. Son of the French banker Étienne Delessert, Benjamin started France's first cotton spinning mill in 1801. The following year he founded a beet sugar factory for which Napoleon titled him "baron." He became regent of the Bank of France (1802) and founded the Société d'Encouragement Pour L'Industrie. He also was instrumental in introducing savings banks into France.

He was also a botanist and conchologist. He published a catalogue of his botanical library which included some 30,000 volumes.

DELFT, delft, town, the Netherlands, 5 miles southeast of The Hague. This traditional Dutch town, with its web of canals crossed by numerous small bridges, was world famous during the 17th and 18th centuries for its matchless blue-and-white Delftware (q.v.). It is the birthplace of Jan Vermeer (1632-1675) who lived and worked there and found inspiration for his famous *View of Delft*. Hugo Grotius (1583-1645), noted Dutch jurist and statesman, also was born in Delft. His statue stands in the market place. William I of Orange (William the Silent, 1533-1584) was assassinated in the Prinsenhof which is now a museum depicting the liberation of the Netherlands (1568-1648). Its picturesque streets are lined with 16th and 17th century buildings including the town hall and East Indian House. The 13th century Gothic Old Church holds tombs of Admiral Martin Tromp and naturalist Anton van Leeuwenhoek. William I's mausoleum and Hugo Grotius' tomb rest in the 15th century New Church. Modern Delft industries include glassware, paints, dyes, chemicals, distilled liquors, tobacco, machinery, cables, industrial belting and leather goods. It also is a cattle and dairy market and the seat of a technical university. Founded in 1075 Delft received its charter in

1246. It was occupied by the Germans in May 1940. Pop. (1947) 62,018.

DELFTWARE, a unique, glazed earthenware decorated with colored patterns, especially in blue-and-white. It is one of Europe's outstanding achievements in pottery, both as to artistic decoration and ceramic craftsmanship. It takes its name from the Netherlands town of Delft, the greatest European production center from about 1600 to the close of the 18th century.

Technically, delftware developed from faience, a decorated earthenware with a tin oxide glaze first made at Faenza, Italy in the 15th century. By 1548 one Guido di Savino had migrated to Antwerp and established a faience pottery there. Within the next 20 years several similar potteries appeared in the Netherlands. From early in the 17th century and continuing for close to 200 years the best of such faience was produced by Delft potteries which eventually numbered 28. Delftware was extensively exported to other European countries, England and colonial North America. Today delftware pieces, especially those made from about 1650 to 1725, are highly regarded by ceramic connoisseurs. They are included in the best museum collections of Europe and America.

The most notable pieces are decorated with landscape, marine and genre scenes painted by recognized Dutch artists. Others were decorated by Delft ceramists skilled in copying the splendid designs of Chinese and Japanese porcelains imported by the Dutch East India Company. Their brushes, however, had a unique Delft touch which greatly influenced ceramic art in Europe and England.

Delft potters used a mixture of clays brought from Tournai on the Schelde River and Mulheim on the Rhine. This mixture produced a light, thin body. After shaping, the pieces were given a light firing followed by a coating of oxide of tin solution and an air drying. Decorations were painted with cobalt and other metallic pigments. After a second air drying, decorated surfaces were dusted with powdered lead. Lastly, the pieces were fired at a high temperature which completely fused the pigments, tin oxide and lead. The lead produced a colorless, secondary glaze which greatly enhanced the brilliance of the warm, powerful colors. Thus, all pieces of delftware were fired twice. Some, with iron red or gilded decoration, were fired four times.

Frederick Frijt, a landscape painter, and Abraham de Cooge, a Haarlem artist, were among early artist-decorators. Samples of their work are still extant along with those of 17 others. Some signed their pieces with ciphered initials. Their work included several 12-plate sets decorated with such subjects as *The Twelve Months of the Year* by Huilbrecht Brouwer; *The Passion of Christ* by Willem Kleffius; *The Herring Fishery* by Justus Brouwer; and a set depicting ships along the Dutch coast also attributed to Justus Brouwer.

Delft potters also produced decorative tiles, cups, beer tankards, pots, vases, plaques, animal figures and even bird cages. See FAIENCE.

From about 1725 to 1800 master potters marked their pieces with symbols connoting the names of their shops, such as "The Three Bells," "The Peacock," "The Porcelain Axe," and "The Stag." A record of about 50 of these marks and the potteries using them was deposited in the Delft town hall in 1764.

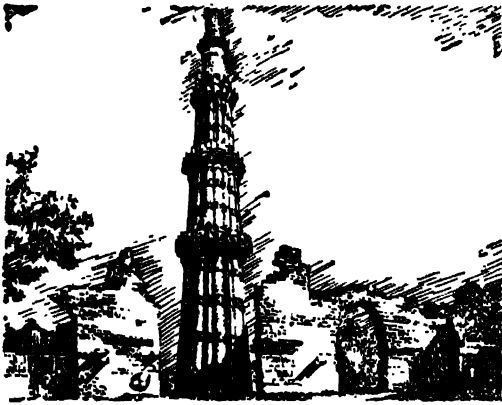
At the close of the 18th century handmade delftware was largely supplanted by less expensive, machine-printed porcelains and faïences imported from England. Most of today's so-called delftware is produced by a pottery factory at Makkum in Friesland Province.

THOMAS H. ORMSBEE.

DELFIJL, delf-zil', commune, the Netherlands, Groningen Province, on the Ems estuary. This simple Dutch harbor community is much the same today as it was a century ago. A lumber and trade center, it also exports dairy and agricultural products and carries on shipbuilding, sugar refining, and cement manufacturing industries. Pop. (1947) 7,921.

DELHI, dēl'i (Hindi DILLI or DEHLI), state, north central India, 574 square miles, southeast of Punjab State, altitude 709 feet. The British carved Delhi out of the Punjab as a small administrative unit in 1912 when Delhi city replaced Calcutta as the capital of British India. It includes 65 villages formerly in the Meerut division of the United Provinces. It now is centrally administered by the Republic of India as a Part C (chief commissioner's) State under the Indian Constitution.

The 50-square-mile area south of New Delhi city contains more historic ruins than any other part of India. Everywhere one looks the graceful remains of old walls, forts, tombs, mosques and temples point to ancient Hindu, Moslem and Mogul empires which all are part of India's history. Among them is the 13th century Kutb



The Kutb Minar, Delhi.

Minar with its famous 5th century iron pillar located three miles south of New Delhi on the city's earliest site. Rising 238 feet from the ground, its five fluted red sandstone and white marble stories broken by balconies comprise one of the world's most perfect towers. About five miles east of the Kutb stand the imposing walls of Tughlakabad, a ruined city built about 1321 by the founder of the Moslem Tughlak dynasty. Humayun's tomb, a noble Mogul monument (1565-1569) four miles southeast of New Delhi city center, is the architectural prototype of the famous Taj Mahal.

Village industries include hand-woven cotton, glass bangles, and pottery. Delhi villagers also work as stone-cutters, blacksmiths and tanners. As farmers they grow wheat, gram, barley, millet and sugarcane. Suburban industrial-training

colonies established by the Indian government have rehabilitated many of more than 500,000 refugees who migrated to Delhi from Pakistan when India was partitioned in 1947. Pop. (1951) 1,744,072.

DELHI, dēl'hī, village, New York, Delaware county seat; in the Catskill Mountains; on the west branch of the Delaware River, about 50 miles south of Utica. Located in a dairying and mountain resort area, trade is carried on in feed, barrels, and dairy products. Delhi also has a state agricultural and technical institute. It was settled about 1785 and incorporated in 1821. Pop. (1950) 2,223.

DELHI, town, Ontario, Canada, on Big Creek, about 34 miles east of St. Thomas. Its industries include tobacco processing, natural gas production, glove manufacturing and lumbering. Pop. (1951) 2,517.

DELHI, New, and DELHI, Old, dēl'i, adjoining cities, India, in Delhi State, north central of the country, on west bank of the Jumna River, 740 miles northeast of Bombay, 800 miles northwest of Calcutta. New Delhi is the capital of the Republic of India. The old city of Delhi, often called Old Delhi, is the capital of Delhi State and former capital of British India, from 1912 to 1931 when New Delhi was officially inaugurated directly south of it.

The climate is dry and hot. Yearly rainfall averages about 30 inches. Most of it falls from July through September. Mean temperatures range from 60°F. in December (during the cool, pleasant Delhi winter) to 90°F. in May and June (when the thermometer often soars beyond 110°F.).

Both cities comprise an important Indian communications and trade center. Delhi textile mills produce cotton and wool cloth. Its factories manufacture hosiery, military clothing, shoes, chemicals, pottery, brass and iron utensils. There also are iron foundries, flour mills, biscuit and sugar factories, printing and publishing plants. Famous Old Delhi handicrafts include ornamental gold and silver filagree work, ivory and wood carving, shawls, and embroidery.

As the seat of the central Indian government, New Delhi is an attractive, modern, symmetrically-planned world capital. It has diagonal avenues, a central mall with continuous water canals, and a majestic processional way leading up to the president's house (former viceroy residence) and two large secretariat blocks. Since 1929, when the British completed it as a symbol of the British Raj, it has stood next to the ancient walled city of Old Delhi. The Republic of India's bicameral legislative chamber (Council of States and Assembly of Delegates) now convenes in its circular, British-built Parliament House.

Like the surrounding countryside, carefully preserved monuments of the past are in evidence everywhere in Delhi. Most of the old city is encircled within remains of a 30-foot wall, pierced by seven great gates along its five-and-a-half mile length. It was built in 1638 by the Mogul emperor Shah Jahan who beautified Delhi and made it a symbol of imperial Moslem splendor in the early half of the 17th century. Delhi's spectacular Red Fort, with its red sandstone walls and gateways, encloses the imperial palace which Shah Jahan erected from 1638 to 1648. Its most notable buildings are the admirably proportioned

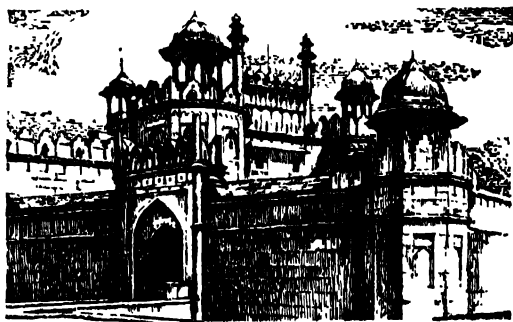
Diwan-i-Am or public audience hall with 60 red sandstone pillars, and the white marble Diwan-i-Khas, private audience hall which sheltered the famous jeweled Peacock Throne until the Persian invader Nadir Shah carried it off in 1739.

Within view of the fort, directly southwest of it, Shah Jahan's Juma Masjid or Great Mosque stands 201 feet high. Flanked by two minarets and capped with three white marble domes, this red standstone edifice (1644-1658) is one of the world's largest and most beautiful mosques.

Rajghat, where Mahatma Gandhi was cremated on January 31, 1948, is located south of the fort, on the banks of the Jumna. Chandni Chauk, or the "Silver Street," Delhi's famous bazaar area, runs directly west of the fort. Once called the richest street in the world, silver- and goldsmiths still market their beautiful handicrafts here.

The University of Delhi and the well-equipped Central Agricultural Research Institute also are located in Old Delhi. It was the site of imperial durbars (receptions for native princes) from 1877, when Victoria was proclaimed Empress of India, to 1911.

History.—Seven cities rose and fell on or near the site of the present twin cities. The oldest is the semi-legendary Indraprastha described in the Hindu epic *Mahabharata* (c.400



The Red Fort, Delhi.

b.c.-200 A.D.). Recorded history begins in the 11th century when the Rajput chief Anangapala (Anang Pal) built a red fort on the site of the Kutb Minar. Lured by India's fabulous wealth, wave after wave of foreign invaders captured the city in rapid succession. Mohammed of Ghor took it in 1192. His deputy, Kutb-ud-din made it the capital of the Moslem Slave dynasty in 1206. He was the first of a long succession of Turko-Afghan rulers known as Delhi sultans who reigned over all of north India during the 13th and 14th centuries. The Sultanate fell when Tamerlane sacked Delhi in 1398 or 1399. Baber, founder of the Mogul dynasty, occupied Delhi in 1526. His famous successor Shah Jahan rebuilt the present walled city between 1638 and 1658. The Persian Nadir Shah pillaged Delhi in 1739 and Hindu Maratha princes held it from 1771 until the British took it in 1803. During the Sepoy Rebellion of 1857 Indian mutineers held Delhi for several months. In 1912 it replaced Calcutta as the capital of British India until New Delhi was officially inaugurated in 1931. Pop. (1951) Old Delhi, 914,790; New Delhi, 276,314.

Consult Hearn, Gordon R., *Seven Cities of Delhi* (2d ed., 1929); Sharp, Henry, *Delhi: Its Story and Buildings* (2d ed., 1929); Spear, T. G. Percival, *Delhi, A Historical Sketch* (1937); and *Delhi: Its Monuments and History* (1945).

DELHI SULTANATE, Moslem state which ruled north India for two centuries (1206-1398). It was founded by Kutb-ud-din, Afghan general and slave-deputy of Mohammed of Ghor, who captured Delhi in 1192. Kutb-ud-din's slave dynasty lasted almost a century, until 1290. It was replaced by the shortlived but powerful Khilji dynasty (1290-1321), which extended the sultanate's reign over almost all of India except the extreme south and inner strongholds of Rajputana. Under the succeeding Tughlak kings (1321-1414) further territorial expansion took place. The sultanate was at its height from 1311 to 1347, but a decline soon set in. The Vijayanagar kingdom in the south developed as an effective Hindu counterforce to the Moslem military kingdom in the north. Revolts raged and a considerable amount of territory was lost. Tamerlane's sack of Delhi (1398) finally broke the sultanate's power. Local rulers continued to hold Delhi and the surrounding territory until the Mogul emperor Baber defeated the last of the Delhi sultans in the Battle of Panipat (1526).

DELIAN LEAGUE (also called CONFEDERACY OF DELOS), a confederation of Greek states founded in 478 B.C. under Athenian leadership. It was the first attempt of highly developed, self-governing states to take united action against a common enemy.

The first alliance, lasting from 478 to 404 B.C., was formed between Athens and a number of Ionian states (mostly maritime) to protect themselves against the growing power of Persia. League headquarters, with a council and treasury, were established in the temple of Apollo and Artemis on the island of Delos. All members had an equal number of votes in the council. All contributed funds, troops and ships to strengthen the Athenian navy. League affairs proceeded on a smooth course at first under able, just Athenian leadership. Its mission was accomplished when the Persians were defeated at the battle of Eurymedon (c.468 B.C.). After the death of the Persian king Xerxes I (465 B.C.), several member states attempted to withdraw from the league. With diplomacy and force Athens managed to keep its members, which now numbered well over 200 states, together. It thwarted a prospective Spartan invasion 457 B.C. and subdued Thebes. When the treasury was moved from Delos to Athens in 454 B.C., the league became an Athenian empire which lasted until Athens was captured by Sparta at the close of the Peloponnesian War (404 B.C.).

Athenian sea power was later revived and Athens formed a second league in 378 B.C. to unite her allies against the ambitions of Sparta. In 376 B.C. she defeated Sparta in the naval battle of Naxos. Subsequent peace terms gave her sea supremacy and Sparta land supremacy on the Greek mainland. By 354 B.C. Philip II of Macedon had taken all the Thracian and Macedonian cities from the league. He eventually destroyed it in the battle of Chaeronea (338 B.C.). Its failure led to Macedonian hegemony and ultimately to the Roman conquest.

DELIBES, də-lēb', (Clément Philibert) Léo, French composer: b. Saint Germain du Val, France, Feb. 21, 1836; d. Paris, Jan. 16, 1891. He studied at the Paris Conservatoire, served as an accompanist at the Théâtre Lyrique and as second chorus master at the Grand Opéra. He

soon became noted for his light-hearted, enchanting ballets, operettas and operas. His ballets include *Coppélia* (1870), an enormous success, and the mythological *Sylvia* (1876). *Le Roi l'a dit* (1873), a comic opera, was his first important dramatic work. *Lakmé* (1883) is still his most popular opera. In 1881 he was appointed professor of advanced composition at the Paris Conservatoire and in 1884 he replaced Victor Massé at the Institut de France.

DELILAH, dê-lî'là, the Philistine woman beloved by Samson in the Bible. Bribe by Philistine chiefs, she discovered that the source of his great strength lay in his long, thick hair. While he was asleep she had it cut off, thereby delivering him into the hands of his enemies. The story is told in the Book of Judges (16:4-20).

DELILLE, dê-lêl', Jacques, French poet: b. Auvergne, France, June 22, 1738; d. Paris, May 1, 1813. An illegitimate child, he studied at the college of Lisieux in Paris and became an elementary school teacher. His verse translation of Virgil's *Georgics*, published in 1769, made him famous and obtained his admission to the French Academy in 1774. Later he became professor of Latin poetry at the Collège de France and abbot of Saint-Séverin. His didactic, descriptive poems showed a genuine love of formal, 18th century Arcadian nature expressed in *Les Jardins* (1782), *L'Homme des Champs* (1800), and *Les Trois Règnes de la Nature* (1808). Impoverished by the French Revolution he went into voluntary exile in Germany, Switzerland and England while working on his translations of Virgil's *Aeneid* (1804) and of Milton's *Paradise Lost* (1805). His *Oeuvres Complètes* was published posthumously in 1833.

DELIQUESCENCE, dêl-î-kwēs'ëns (Lat. "to melt away") is a term applied to substances whose solutions have a lower vapor pressure than that of air at average humidity. When solid sodium hydroxide, for example, is exposed to moderately moist air, it absorbs enough atmospheric water to form a visible film. Calcium chloride is so soluble that it dissolves completely. The term "deliquescent" is commonly reserved for substances like calcium chloride. In less pronounced cases, the word "hygroscopic" is used.

DELIRIUM, dê-lîr'i-ûm, a temporary condition of mental excitement ranging from slight cloudiness of the brain to maniacal delusions, illusions, and hallucinations. It may arise from toxic factors in diseases or drugs. Sudden withdrawal of alcohol or morphine from addicted persons may bring on an attack. It also may occur in cases of physical collapse or it may follow severe injuries or surgical operations. Head injuries frequently are accompanied by delirium. Such acute febrile diseases as lobar pneumonia, typhoid, typhus, and meningitis often are complicated by delirium. It also is a manifestation of some brain diseases such as syphilitic dementia (paresis), epilepsy, or manic-depressive insanity.

The symptom is seen less frequently today due to improved nursing and medical care and the use of specific remedies in such diseases as pneumonia and meningitis. Proper nursing care is most important in treating any case of delirium. Restraint should be employed only as a last resort.

Dehydration should be prevented since loss of water and vitamins may enhance the delirium. Sedatives such as barbiturates or chloral hydrates often are advised. In general, relief depends upon careful diagnosis of the cause and appropriate treatment.

Delirium tremens is a delirious state of acute alcoholic poisoning marked by extreme exhaustion, muscular tremor (especially of the hands and tongue), and vivid hallucinations. It generally occurs in habitual drinkers but sometimes ordinarily temperate persons suffer from an attack after a prolonged drinking spell. Distilled spirits, rather than beers or wines, are chiefly responsible.

There are two forms with similar symptoms. In the traumatic variety, an accident, even a slight one, may cause the delirium to appear with little or no warning. In the idiopathic variety, an approaching attack is indicated by restlessness, irritability, sleeplessness, sweating and loss of appetite. During the attack the patient cannot rest. He shakes and shivers constantly, mutters incoherently, expresses vague but acute fear and paranoiac reactions. He has extremely distressing hallucinations, often of small animals or insects such as snakes, bats, rats, mice and spiders. He may try to escape from his torments and must be protected from self-injury. His temperature usually rises (100°-103°F.), his skin is flushed, the pulse rapid and feeble. He may not eat, sleep, or drink throughout the attack which usually lasts several days, ending with sound sleep.

In private practice the outlook for recovery is good, but in institutions mortality has been reported as high as 10 to 15 per cent. Relapses are common. The use of sedatives is not always necessary. In fact, they often are dangerous and must be administered only under medical supervision. Continuous warm baths, showers, intravenous saline injections, moderate restraint, massage and light food (such as milks and soups) often are recommended until the attack subsides. The patient should always be kept in bed and constantly attended. Chloral hydrate in experienced hands is often helpful.

Delirium tremens may be mistaken for the confused mental state often present in cases of acute meningitis, typhus, typhoid, or chronic alcoholism. A careful case history may eliminate the febrile diseases. The presence of intense thirst and muscular tremor, especially of the tongue, indicates alcoholic delirium.

HAROLD WELLINGTON JONES, M.D.,
"Blakiston's New Gould Medical Dictionary."

DELIRIUM TREMENS. See DELIRIUM.

DE LISLE, Charles. See LECOMTE DE LISLE, C.M.R.

DELISLE, dê-lêl', Guillaume, French geographer: b. Paris, France, Feb. 28, 1675; d. there, Jan. 25, 1726. When he was 25 years old, Delisle published (1700) maps of Europe, Asia and Africa, and a celestial and terrestrial globe. By rejecting Ptolemy's statements of longitude, or rather by comparing them with more recent data, he prepared the most accurate world map of his time. He was admitted to the Académie de Sciences in 1702 and became chief geographer to Louis XV in 1718. He is one of the founders of modern geography.

DELISLE, Joseph Nicolas, French astronomer: b. Paris, April 4, 1688; d. there, Sept. 11, 1768. He was a brother of Guillaume Delisle. Among his works was *Mémoires pour servir à l'histoire de la géographie et de la physique* (1738).

DELISLE, Leopold Victor, French scholar: b. Valognes, Oct. 24, 1826; d. Chantilly, July 21, 1910. He studied at the École des Chartes and then devoted his early works to the history of his native province, Normandy. In 1852 he entered the Bibliothèque Nationale and in 1857 was elected to the Académie des Inscriptions et Belles Lettres. In 1874 he became administrator of the Bibliothèque Nationale, and supervised the printing of the *Catalogue général*, begun in 1897. His numerous works have been catalogued by Paul Lacombe in 1902 with a supplement in 1911.

DELITZSCH, dā'lich, Franz, German Lutheran theologian: b. Leipzig, Feb. 23, 1813; d. there, March 4, 1890. He was educated in the university of his native city, became professor at Rostock in 1846, Erlangen in 1850, and in 1867 at Leipzig. His earlier works dealt with post-Biblical Jewish literature, and he afterward wrote commentaries on various books of the Old Testament. He was also the author of numerous theological and devotional works, among which were *Philemon oder von der christlichen Freundschaft* (1858), *System der biblischen Psychologie* (1861), and *Das Sakrament des wahren Leibes und Blutes Christi* (1876).

DELITZSCH, Friedrich, German Assyriologist: b. Erlangen, Sept. 3, 1850; d. Langenschwalbach, Dec. 19, 1922. He was the son of Franz Delitzsch. He was professor at the universities of Leipzig, Breslau, and Berlin. His lectures attained a wide popularity, and in 1906 he lectured in the United States. He was author of an Assyrian dictionary, Assyrian grammar, and books on Assyrian literary remains.

DELITZSCH, city, Germany, in Land Saxony-Anhalt, 13 miles north of Leipzig. It is a market-gardening center. The town's industries include brewing, cigar-making, preparation of cereals, sugar refining, chocolate, and shoe-making. Pop. (1946) 25,148.

DELIUS, dē'li-ūs, or dēl'yūs, Frederick, British composer: b. Bradford, England, Jan. 29, 1862; d. Grez-sur-Loing, France, June 10, 1934. Born of German parentage, his father, Julius Delius, was a wool merchant in Bradford. Frederick Delius was educated in the Bradford Grammar School and the International College at Isleworth. Although from childhood he showed musical aptitude, his father was insistent that he should enter the family business. To escape, Delius proposed to go to Florida as an orange planter.

This American interlude began in 1884 when he arrived at Solano Grove on St. Johns River, Florida. Here, although not lax in his enterprise, his true interests were developing. After acquiring a piano, he studied with a Brooklyn organist, Thomas F. Ward, who was then recuperating in Florida. In August 1885, Delius abandoned the plantation after what he later considered the most valuable musical education

he ever received. A short-engagement as a singer and organist at a synagogue in Jacksonville and Delius moved on to Danville, Va., where he was received with much delight as a private teacher of music. His considerable earnings now encouraged his ambition to study in Leipzig. After a brief stay in New York as a church organist he returned home, his family previously having lost contact with him.

In August 1886 he entered Leipzig Conservatory and studied under Hans Sitt, Karl Reinecke, and Salomon Jadassohn. During this period he met Grieg and under his influence toured Norway the following summer. The first performance of a Delius work took place in 1888 with the presentation of *Florida* (1886-1887). He made his residence in France, working for eight years in Paris, and after his marriage to Jelka Helen von Rosen in 1897, lived at Grez-sur-Loing.

An illness which began about 1922 developed into paralysis and the eventual loss of his sight. However, he continued to compose with the help of Eric Fenby who acted as an amanuensis. The Delius Festival, organized and presented by Sir Thomas Beecham in 1929, was the last public event of the composer's life.

His music lacks conventional form but the lyric line and harmonies are free for poetic expression. Principal works include *A Village Romeo and Juliet* (1900-1901) and five other operas, chamber music, and songs; among the outstanding orchestral works are *Over the Hills and Far Away* (1895), *In a Summer Garden* (1908), *Eventyr* (1917), and *A Song of Summer* (1929); and the choral works include *Appalachia* (1902), *Sea Drift* (1903), *A Mass of Life* (1904-1905), and *A Song of the High Hills* (1911-1912).

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DELIUS, dā'lē-ōs, Nikolaus, German Shakespearean critic: b. Bremen, Sept. 19, 1813; d. Bonn, Nov. 18, 1888. He studied philology at Bonn and Berlin, and in England and France. He settled in 1846 in Bonn, where he taught from 1855 to 1880. He published a critical edition of Shakespeare (1854-1861); *Shakespeare-Lexikon* (1852); *Über das englische Theaterwesen zu Shakespeares Zeit* (1853).

DELLA CRUSCANS, dēl-à krus'kans, a coterie of English poetasters resident about 1785 in Florence. The group penned verses which were published in *The Arno* and *The Florence Miscellany* and in England in *The World*. The chief exponent was Robert Merry who had been elected to the Accademia della Crusca and used Della Crusca as a pseudonym. Notwithstanding the inconceivable silliness and affectation of these productions they found numerous admirers. The frenzy was, however, of short duration. *The Baviad* (1794) and *Maeviad* (1795) of William Gifford swept the insipid type into merited oblivion.

DELLA QUERCIA, Jacopo. See QUERCIA, JACOPO DELLA.

DELLA ROBBIA, Luca. See ROBBIA, LUCA DELLA.

DELLA ROBBIA WARE, brown terracotta bas-reliefs thickly enameled with tin-glaze; made at Florence (chiefly in 1450-1530; in France 1530-1567); so called from the name

of the artist and its inventor, Luca della Robbia. In 1954 Italian cities such as Florence and Siena still contained much Della Robbia ware, in its original settings.

DELLENBAUGH, dĕl'ĕn-bō, **Frederick Samuel**, American artist and author: b. McConnelville, Ohio, Sept. 13, 1853; d. New York, N.Y., Jan. 30, 1935. He was educated in Buffalo, New York City, Munich, and Paris. He was topographer and artist of John Wesley Powell's second expedition down the Colorado River in 1871-1873, accompanied the Edward H. Harriman expedition to Alaska and Siberia in 1899, and made several personal expeditions to the Southwest. From 1909 to 1911 he was librarian of the American Geographical Society. He wrote *The North Americans of Yesterday* (1900), *The Romance of the Colorado River* (1903), *Breaking the Wilderness* (1905), *A Canyon Voyage* (1908), *Fremont and '49* (1913), and *Life of Gen. George A. Custer* (1916).

DELLYS, dĕl'ĕs', town, Algeria, located in Alger Department, on the Mediterranean Sea, 50 miles east-northeast of Algiers. A small port of the Great Kabylia region, it ships products such as figs and wines. Pop. (1948) 5,269.

DEL MAR, dĕl' mār, **Alexander**, American political economist and mining engineer: b. New York, N. Y., Aug. 9, 1836; d. Little Falls, N. J., July 1, 1926. Educated in Europe and at New York University, he edited *Hunt's Merchants' Magazine* in 1860, the *Social Science Review* in 1864, and the *Financial Chronicle* in 1865. He organized the United States Bureau of Commerce, Navigation, Emigration, and Statistics (later the Department of Commerce and Labor), and was its director from 1866 to 1869; in 1876 he was mining engineer of the United States Monetary Commission. He was president of the Latin-American Chamber of Commerce. His works include *Gold Money and Paper Money* (1862), *A History of the Precious Metals from the Earliest Times to the Present* (1880; 2d ed. 1901), *The Science of Money* (1885), and *Money and Civilization* (1886).

DELMONTE Y TEJADA, dĕl-mōn'tā ē tĕ-hā'thā, **Antonio**: Dominican historian and government official: b. Santiago de los Caballeros, Dominican Republic, Sept. 29, 1783; d. Havana, Cuba, Nov. 19, 1861. He studied law at the University of Santo Domingo. His share in the campaign against Toussaint l'Ouverture led to his leaving the country in 1804, and after 1806 he lived at Havana and held government positions there. He is the author of *Historia de Santo Domingo* (vol. 1, 1853), a history of the island from its discovery.

DELOLME, dĕ-lōlm', **Jean Louis**, Swiss jurist and writer: b. Geneva, Switzerland, 1740; d. Sewen, Switzerland, July 16, 1806. He at first practiced law in his native city, but his publication of the pamphlet *Examen de trois parts de droit* led to his exile in England until 1775. His works include *Constitution de l'Angleterre* (1771; Eng. tr. 1772), *Parallel between the English Government and the Former Government of Sweden* (1772), *A History of the Flagellants* (1782), and *An Essay on the Union of Scotland with England* (1787).

DELONEY or **DELONE**, dĕ-lō'nī, **Thomas**, English writer: b. probably at London, ?1543; d. ?1600. A silk weaver by trade, he became a popular ballad writer in the 1580's. His historical ballads appear in *Strange Histories* (1602), later reissued as *The Royal Garland of Love and Delight* and *The Garland of Delight*. In 1596, having incurred official disfavor with a ballad on the scarcity of corn, he turned to prose fiction. Contemporary life is vividly depicted in his narratives, *Jack of Newberie* (1597), which deals with the weaver's trade; *The Gentle Craft* (2 parts, 1597-1598), which deals with the shoemaker's trade and on which Thomas Dekker based *The Shoemaker's Holiday*; and *Thomas of Reading* (1600), which deals with the clothier's trade. A collection of his works, edited by F. O. Maun, was published in 1912.

DE LONG, dĕ lōng', **George Washington**, American naval officer and Arctic explorer: b. New York, N. Y., Aug. 22, 1844; d. Siberia, Oct. 30, 1881. Graduated from the United States Naval Academy in 1865, he became a lieutenant in 1869 and a lieutenant commander in 1879. He went to the Arctic in 1873 with the *Juniata*, which was sent to search for the missing steamer *Polaris*. In 1879 he secured the backing of James Gordon Bennett for a voyage of Arctic research, and sailed in July in command of the *Jeannette*, with a crew of 33. The vessel was trapped in an ice pack off the Siberian coast on Sept. 5, 1879, and drifted northwestward until it was crushed and sank in June 1881. De Long and some of his men reached the mouth of the Lena River, Siberia, but died there of cold and starvation. The chief engineer of the *Jeannette*, George W. Melville, recovered the expedition's records, including De Long's journal, which his wife Emma De Long, edited and published as *The Voyage of the Jeannette* (1883).

DELORME or **DE LORME**, dĕ-lōrm', **Marion**, French courtesan: b. Baye, Department of Marne, France, Oct. 3, 1613; d. Paris, 1650. The mistress of the Marquis de Cinq-Mars, she is reputed to have had a long list of lovers after his death, including the Seigneur de Saint Évremond; George Villiers, 1st Duke of Buckingham; Comte Philbert de Gramont; and the Great Condé Jules Cardinal Mazarin ordered her arrested for complicity in the Fronde uprising of 1650, but she was found dead by the arresting party. The story arose in France that her death and funeral were a mere pretense, got up to permit her to escape. According to the legend, she married several times, and died in extreme poverty in 1706, or, according to another story, in 1741. Victor Hugo's play, *Marion de Lorme* deals with her life, and she figures prominently in Comte Alfred de Vigny's novel *Cinq-Mars*.

DELORME or **DE L'ORME**, **Philibert**, French architect: b. Lyons, France, 1510-1515; d. Jan. 8, 1570. He studied in Rome from 1533 to 1536. Royal architect under Francis I and Henry II from 1547 to 1559, he designed, built, or rebuilt many French architecture landmarks and in that work achieved his place as one of the great architects of the Renaissance in France. His best design was perhaps that for the Château d'Anet, executed for Diane de Poitiers, the mistress of Henry II. Marked by freedom and boldness, the design for the château suggests the

baroque style without the heavy-handedness of baroque. Delorme's many other works include the Château de Saint-Maur-des-Fossés, done for his early patron, Jean Cardinal du Bellay; the tomb of Francis I at Saint-Denis; the gallery at the Château de Chenonceaux, executed for Catherine de Médici; a château at Meudon; and the palace of the Tuileries, on which he worked during his last years. He was the author of *Nouvelles inventions pour bien bâtir et à petits frais* (1561), long regarded as an authoritative work, and *Le premier tome de l'architecture* (1567).

DELORME, Pierre Claude François, French genre painter: b. Paris, July 28, 1783; d. there, Nov. 8, 1859. He was a pupil and imitator of Girodet-Trioson, and his paintings followed the classicism of Jacques Louis David. His chief works include *La Mort d'Abel* (1810), *Jésus ressuscitant la fille de Jaire* (1817), and *Céphale enlevé par l'Aurore* (1822).

DELORT, dê-lôr', Charles Edouard, French painter: b. Nîmes, Department of Gard, France, Feb. 4, 1841; d. Saint Eugène, Algeria, March 10, 1895. He was a pupil of Charles Gabriel Gleyre and Jean Léon Gérôme. His works include *Chloe* (1866), *Fauconnier* (1870), *Marauders* (1874), *Embarquement de Manon Lescaut* (1875), *Braconnier* (1880), *Retour de chasse* (1888), and *Retour d'exil* (1889).

DELOS, dê-lôs (ancient Asteria, Cynthus, or Ortygia), the central and smallest island of the Cyclades, in the Aegean Sea, a rugged mass of granite about two square miles in extent. Near the center of the island is a rocky hill, Mount Cynthus, 360 feet high.

Delos, according to old legends, was raised from the sea bottom by Poseidon. It was then a naked rock floating about in the ocean, and was accidentally driven by the waves into the center of the Cyclades. The earth had promised Hera (Juno), with an oath, not to grant a resting place to the fugitive Latona where she might be delivered. The unhappy goddess wandered restlessly over the earth, until she perceived the floating island. As this was not stationary, it was not comprehended in the oath of the earth and offered her an asylum. Here Latona bore the infant gods Apollo (who was hence called *Delios*) and Artemis (who was called *Delia*). Both were worshipped on this island. Delos was thenceforth no longer the sport of the winds; it was moored to the bottom of the Aegean with adamant chains by Zeus, and the fame of the isle spread over the world. Thus far mythological tradition.

Archaeological evidence proves that there was an Early Bronze Age village of pre-Greek Cycladic people on Mount Cynthus around 2000 B.C. Contact with Minoan Crete is attested by some sherds. Mycenaean Greeks occupied Delos around 1400 B.C. They settled in the plain and left traces at several sacred spots. A hoard of fine ivories has been found under the temple of Artemis and two Mycenaean graves were regarded in Classic times as sepulchres of Hyperborean virgins, legendary priestesses of Artemis and Apollo. The sanctuary seems to have survived during the stormy times which followed the downfall of Mycenaean civilization. Primitive structures of the Geometric Age (900-700 B.C.) have been discovered under the temple of Artemis

and the House of the Naxians. By 700 B.C. Delos was a flourishing cult center. The Homeric Hymn to Apollo describes how the Ionians came together to celebrate the god with festival and fair, dance and song. Under leadership of the Naxians, who dedicated a marble colossus and buildings, archaic Delos prospered.

In the course of time Delos came under the dominion of Athens. In 477 B.C. it became the common treasury of the league against Persia, but the money was afterward transferred to Athens. In 426 the Athenians purified Delos by removing all the tombs, and thenceforth they prohibited births and deaths from taking place on the island. In 422 they removed all the Delians from the island in order to complete its purification, but soon afterward these were allowed to return. After the destruction of Corinth the rich Corinthians fled thither and made Delos the seat of a flourishing commerce. Favored by Romans, Delos became a center of slave trade and was much frequented by Roman and Italian merchants. It had a remarkable altar, from which the Delian problem (doubling the cube), as it is called, had its name. The inhabitants, having consulted the oracle concerning the remedy for a plague which raged in Delos, were ordered to double the altar of Apollo, which was a cube. A solution of this problem of the duplication of the cube was attempted in different ways by several of the ancient mathematicians. The Grecians celebrated the Delian festival here every five years; and the Athenians performed annually the pilgrimage called *theoria*, with procession and dances.

In 1829 the work of exploration of the ruins began under Guillaume Blouet. Since 1877 the work of excavation, still under French auspices, has proceeded despite interruption by two wars. Delos may also be termed the Greek Pompeii in view of the scientific results which it has yielded. The complete plan of the sacred precinct of Apollo has been recovered together with the theater, the temple on Mount Cynthus, the temples of foreign gods, and an extensive part of the commercial and residential section of Hellenistic and Roman data. Sculpture of all periods has been found in abundance, as well as inscriptions throwing light on various points of discussion. Not the least interesting of the finds has been a series of accounts, presenting what may be called a balance sheet, which throws light on the mundane or financial side of the religious life of the time.

From the ancient mole there is an approach to the precinct of Apollo through an avenue flanked by porticoes. Three temples of Apollo are the center of the precinct. The largest was begun by Delians around 480 B.C. and finished in 314 B.C.; a smaller temple was dedicated by the Athenians in 417 B.C. These two were Doric. The smallest and earliest is archaic. In the northwest corner of the precinct is the temple of Artemis and a structure identified as the famous "altar of horns," originally composed of the horns of goats.

To the south of the precinct of Apollo are large remains of the town of Delos. In the 2d and 1st centuries B.C., Delos was the chief commercial town of the eastern Mediterranean. The shore, facing Rhenea, was lined with docks and warehouses. The sanctuaries contain exvotos, stelae, and inscriptions on marble and bronze giving in full detail accounts of the high priests and

catalogues of the offerings brought by pilgrims. Streets, gardens, and sewage canalization may be distinctly traced. Splendid private houses of rich merchants have been discovered and reconstructed. They are decorated with wall paintings and mosaics and are regarded as the best examples of Hellenistic peristyle houses. Among other notable buildings is the curious grotto on Mount Cynthus now known to be an early Hellenistic shrine of Hercules; the famous Hypostyle Hall, a commercial building of the 3d century B.C.; and several magnificent porticoes given by Hellenistic kings. North of the Apollo precinct is the Sacred Lake, now dry. A row of splendid archaic marble lions roar at the palm tree in the lake under which Apollo and Artemis were born.

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GEORGE HANFMANN,
Curator of Classical Art, Fogg Museum, Harvard University.

DELPHI, dēl'fī, Greek city-state situated in Phocis on the lower southern slopes of Parnassus some 2,000 feet above the Gulf of Corinth. It was the seat of the oldest and most sacred sanctuary and of the most famous oracle in ancient Greece. According to legend, Zeus, wishing to determine the exact center of the earth, released two eagles from opposite ends of the world. Their meeting point was marked by the Omphalos, an ovoid stone which in historic times lay in the inner sanctuary of the Temple of Apollo. This fetish was probably the oldest cult-object on the site. Archaeology proves that Delphi was occupied in Mycenaean times. By the 5th century B.C. it was generally believed that the earth goddess (Gaea) first possessed Delphi, then her daughter Themis, and finally Apollo, with whom Dionysus somehow was associated.

The first reference to an oracle at Pytho, the older and ritual name of Delphi, is in Homer's *Odyssey*, book viii, lines 79-81. Since the oracle survived until 390 A.D., changes in oracular methods may well have occurred. These possible changes, the ambiguous literary and archaeological evidence, and the philosophical and religious speculations on the phenomenon make certainty on the oracular technique impossible. The traditional view is that the priestess, the Pythia, entered the small inner sanctuary of the Temple of Apollo, in which were located a golden statue of Apollo, the Omphalos, the supposed tomb of Dionysus, and a deep chasm surmounted by a tripod whereon she seated herself. After drinking water from a sacred spring, chewing laurel leaves, and shaking a laurel branch, she fell into a trance induced by vapors arising from the chasm. Then, writhing on the tripod, with hair disheveled and lips foaming, in prophetic frenzy she uttered hysterical words which the priests recorded. This view has been challenged recently, because archaeology has revealed no chasm or vapors, and certain ancient writings and artistic representations, if correctly interpreted, imply that the Pythia sat quietly on the tripod. It has been suggested that factors such as the follow-

ing contributed to the legend of the Pythia's delirium: (1) Plato's insistence on the irrational element in prophetic "enthusiasm"; (2) the later materialistic doctrines of emanations from the earth; (3) the association of Dionysus—and hence of his maenads—with Apollo at Delphi; and (4) the confusing of the methods of sibyls with those of the Pythia. Lucan in the 1st century A.D. gave classic form to the conception of the frenzied Pythia, and subsequently various church fathers, in their desire to discredit all things pagan, distorted the picture still more.

The following statements can be made with considerable certainty. The oracle was accessible to all, originally once a year, but from some undetermined date, once a month, except possibly for the three winter months when Apollo supposedly left the shrine to Dionysus. States and individuals who had received privileges from the city of Delphi could consult the oracle on any day except those banned by the liturgical calendar. Before submitting his question the inquirer had to make an offering (originally in kind, later in money), and to sacrifice a goat. If the question was in the form of an alternative, the Pythia may have provided the answer through some system of lot. Other questions were usually presented in writing—presumably to the two prophets or priests who in some way were responsible for the Pythia's answers. Originally a young virgin was chosen as priestess, but, after one had been assaulted, it was ruled that no woman under 50 could hold the position. The older Pythia, nevertheless, wore a young maiden's costume and had to remain chaste while in office. In the flourishing period of Delphi there were apparently two Pythiae and an alternate. Throughout most of the oracle's history the post was held by simple, unlettered women. Only in imperial times did it become fashionable for ladies of prominent families to serve as priestesses.

The cult of Apollo was certainly established at Delphi by the 8th century B.C. In the next century the oracle, through careful collection and shrewd use of information, acquired such fame that it was regularly consulted concerning the sending out of colonies and innumerable other matters, both public and private. Probably by the mid-7th century the amphictyony which met in the Temple of Demeter at Anthela brought Delphi under its control. Thereafter Delphi became the real center of this important religious league. In about 590 B.C. the league fought a sacred war against Crisa, which apparently had been exacting tolls from visitors to Delphi. Crisa was destroyed, her plain was dedicated to Apollo, and, to commemorate the victory, the quadrennial Pythian games were established under the supervision of the Amphictyonic League. In the 7th and 6th centuries Delphi was friendly toward Lydia and received generous gifts from its kings, especially Croesus. During the Persian invasions Delphi discouraged resistance, but, despite this Medism, received many dedications of thanksgiving after the Greek victory in 479 B.C. In the Peloponnesian War of 431-404 B.C. Delphi favored Sparta and was richly rewarded after the capitulation of Athens. In 356 B.C. the Phocians, who had been heavily fined by the Amphictyonic League for alleged sacrilege, seized Delphi. A sacred war was waged against them from 355 to 346 B.C. Although the Phocians stripped the sanctuary of its treasures to hire mercenaries, they were defeated, chiefly by Philip II of Mace-

don, to whom their place in the Amphictyonic League was assigned. About 300 B.C. the Aetolian League seized Delphi, retaining control until its liberation by the Romans in 191 B.C. In 279 B.C. a Celtic attack on Delphi was stopped mainly by Phocians and Aetolians. Thereafter the Aetolian League attempted to make Delphi its religious and artistic capital. Under Roman domination of Greece the oracle was seldom consulted on public affairs. Sulla commandeered many of its treasures when fighting in Greece, and Nero reportedly carried off 500 bronze statues. By the 4th century A.D. the influence of Delphi had sunk so low that Julian the Apostate could not revive it. In 390 A.D. Theodosius I, in the name of Christianity, silenced the oracle forever.

Regular excavations at Delphi were begun by the French in 1892, after the Greek government had removed the village of Kastri which lay above the sacred precinct. The official report—*Fouilles de Delphes*—has not yet been fully published. The sanctuary, a walled area of over 20,000 square yards, was surrounded on three sides by the city of Delphi. The main entrance to the sanctuary was at the southeast, where the Sacred Way began its zigzag climb to the Temple of Apollo. The precinct contained innumerable commemorative monuments dedicated by both states and individuals, some 20 treasures erected by various states, and in the northwest corner a small theater. The Temple of Apollo occupied the central position. The original small temple was burned about 548 B.C. The second temple, for which the Athenian Alcmaeonidae were the chief contractors, was completed in 510 B.C. This building, of which Euripides gives a partial description in his *Ion*, was destroyed by an earthquake in 373 B.C. The new temple, although often damaged, survived until its destruction by Arcadius about 400 A.D. The remains of the architectural monuments and sculpture, works wrought by artists from all over the Greek world, are of the greatest importance for the study of Greek art.

In Greek history the chief significance of Delphi was that it provided a meeting place for the inhabitants of the innumerable particularistic city-states. As an international sanctuary it helped to foster a spirit of Panhellenism, to which the Panhellenic Pythian games contributed. In religion its influence was conservative. On the subject of purification from bloodguilt it took a strong stand and gradually evolved the doctrine that purity was a matter of the spirit rather than of ritual. Its moderate philosophy was well summarized by the maxims inscribed on the wall of the temple of Apollo—"Know thyself" and "Nothing too much."

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JOHN V. A. FINE,
Princeton University.

DELPHI, town, Indiana, Carroll County seat, located on the Wabash River 17 miles northeast of Lafayette; on the Chicago, Indianapolis, and Louisville railway; altitude 668 feet. It has cheese and auto body industries. At the southern edge of the town is Riley Dam, completed in 1930 and named for James Whitcomb Riley, who spent hours fishing in Deer Creek, near the site of the dam. Pop. (1950) 2,530.

DELPHIAN SOCIETY, The, a pioneer organization in the field of higher education for adult women, founded at Chicago, Ill., in 1910. It developed a plan of comprehensive instruction through discussion group meetings. Educational activities of the society are directed by a board of educators.

DELPHIN CLASSICS (*Scriptores Latini . . . ad usum Serenissimi Delphini*), a collection of Latin classics, prepared by order of Louis XIV, king of France (r. 1643–1715), for the use of his eldest son, Louis (b. Fontainebleau, France, Nov. 1, 1661; d. Meudon, France, April 14, 1711), dauphin of France.

The general editor of the project was Pierre D. Huet (1630–1721), who was assisted by Jacques B. Bossuet (1627–1704). Both tutored the dauphin (1670–1680) and both became bishops. The series of 64 volumes, containing the works (authentic and dubious and spurious) of 42 authors, was edited by 32 scholars and was published at Paris between 1674 and 1730—only three volumes appearing after 1689. The cost is estimated at \$75,000 (1914 rate of exchange).

The collection, which marks an epoch in the history of classical literature in France, is uneven both in scholarship and in content. Not all Latin authors then extant are represented. Lucan's *Pharsalia*, a genuine classic, is omitted, probably as too revolutionary for an age of absolutism, but the hymns of Prudentius, a Christian poet, and the poems of Callimachus, a Greek (despite the title's profession), are included. Each volume has a Latin commentary. There is a complete verbal index for each author. Poets and writers of difficult prose are interpreted in easier Latin below the original text. Most volumes have an engraving of Arion (q.v.) and the dolphin in allusion to the Graeco-Latin origin of the title *dauphin* and, to accentuate the analogy, all are inscribed *ad usum Serenissimi Delphini* ("for the Most Serene Dauphin's use"). The dauphin is declared to have celebrated the completion of his formal education by restricting his future reading to the register of births, marriages, and deaths in the weekly *Gazette de France*.

Abraham J. Valpy republished the entire edition at London between 1819 and 1830, but by a change in format and with voluminous additions of variant readings expanded the number of volumes from 64 to 183.

Consult Sandys, Sir John E., *A History of Classical Scholarship*, vol. 2, p. 292 (Cambridge 1908).

P. R. COLEMAN-NORTON,
Princeton University.

DELPHINE, a romance by Madame de Staël, published in 1802. Its bold imagery, keenness of observation and power of impassioned description, perhaps justify its position among the masterpieces of French literature. But neither situations nor characters are true to nature. Several of the great men and women of the time appear in it under thin disguises. As in the case of *Corinne*, the liberal ideas scattered through the story drew down on the author the anger of Napoleon, who ordered her to leave France.

DELPHINIA, a festival celebrated in honor of Apollo (Delphinios being one of his names) at Athens, on the 7th of the month Munychion (April). On this occasion a procession of girls bearing garlands marched to the temple of the

god to seek his favor more especially, perhaps, in the interests of seamen.

DELPHINIDAE, the dolphin family of cetaceans. See DOLPHIN; NARWHAL; PORPOISE.

DELPHINIUM or **LARKSPUR**, a genus of over 200 species of annual, biennial, or perennial herbs mostly of the north temperate zone and the mountains of Africa, belonging to the buttercup family (*Ranunculaceae*). The American species are known either as tall larkspurs, which are 3-7 feet in height, grow in moist places of higher altitudes, and bloom in summer; or as low larkspurs, which are found in open or exposed places to an elevation of 3,000 feet. Only four species of the 79 native in North America occur east of the Mississippi, the majority being western in distribution, often as narrow endemics. The leaves are palmate and variously cut or divided. The flowers are mostly blue, but some are scarlet, red, bluish, white, or even yellow in cultivated forms. The outer part of the flower consists of a calyx of 5 showy, irregular sepals, the uppermost being prolonged into a spur. The corolla consists of 2 sets of 2 petals each, the lower bearing a slender claw extending into the large calyx spur. Many species, especially introduced ones, are cultivated, often in double-flowered forms. Cultivated delphiniums are perennials known as Bouquet larkspurs, originated from *D. grandiflorum* and related forms of Siberia and China; Garland larkspurs (*D. cheilanthum* and related types) from Siberia and China; or, the most popular group, having long thick spikes, tall Candle larkspurs, which are derived from *D. elatum* and related forms of Old World origin. Some low-growing Himalayan and Chinese species are used in rock gardens. Three Old World species are naturalized in the United States, *D. Ajacis, orientale*, and *Consolida*. Excepting locoweeds, larkspurs cause more losses among cattle than any other group of poisonous plants. More than 20 species of larkspur are reputedly poisonous, some throughout life. Most cases of poisoning occur in the spring. Poisoning is due to the presence in these plants of toxic alkaloids such as delphinine, delphinoidine, and delphisine. The Hopi tribes used the pollen of *D. scaposum* by grinding flowers with corn to make blue meal ("blue pollen") for the flute altar.

THEODOR JUST,
Chief Curator, Department of Botany, Chicago
Natural History Museum.

DELPHINUS, dēl-fi'nūs (the dolphin), one of Ptolemy's original 48 constellations, situated between Vulpecula, Pegasus, Equuleus, Aquarius and Aquila. It has no stars brighter than the third magnitude. The names Sualocin and Rotanev assigned to its stars Alpha and Beta are merely reversals of the name Nicolaus Venator, an astronomer's assistant, who wished to commemorate himself.

DELPHOS, city, Ohio, in Allen and Van Wert counties, altitude 776 feet, on the Pennsylvania, the Nickel Plate, and the Akron, Canton and Youngstown railroads, and on state and federal highways, 70 miles southwest of Toledo. It has quarries, and makes motor trucks and trailers, oil cans, metal roofing, bank furniture. The city government is of the mayor-and-council form. The waterworks are municipally owned.

There is a public library. Delphos was settled in 1834, was incorporated as a village in 1851, and became a city in 1913. Pop. (1950) 6,220.

DELRAY BEACH, dēl'rā, city, Florida, in Palm Beach County. This resort city is on the Atlantic Ocean, 18 miles south of Palm Beach, and is served by the Seaboard Air Line and Florida East Coast railroads. It was founded in 1901 and incorporated in 1927. Pop. (1950) 6,312

DEL RIO, city, Texas, Val Verde County seat, altitude 952 feet, is five miles from the Rio Grande; 156 miles west of San Antonio, on the Southern Pacific, and on state and federal highways. It ships out wool, lambs, and mohair. Val Verde County is said to be the largest wool-and-lamb-producing county in the United States. Del Rio is administered under the commission form of government. It has a county library. The water system is owned by the city, and draws from the San Felipe Springs. Pop. (1950) 14,211

DELSARTE, dēl-särt, François Alexandre Nicolas Chéri, French educator: b. Solesmes, Dec. 19, 1811; d. Paris, July 19, 1871. He attained distinction as a tenor singer in the Opéra Comique, suddenly lost his voice, and thereafter applied himself to musical and dramatic instruction, having among his pupils many who afterward achieved operatic and dramatic celebrity. He was author of several melodies and romances, but his chief work was the elaboration of a system of dramatic expression, by which the voice and entire action of the body were trained by fixed rules. He aimed to make elocution a science.

DELSARTE METHOD, a system of physical training for voice and gesture, invented by François Delsarte (q.v.) designed to develop co-ordination and grace.

DELTA, dēl'tā, city, Colorado; on the Gunnison River, 300 miles southwest of Denver; on a freight line of the Denver and Rio Grande Western Railroad; altitude 4,980 feet. It is an agricultural community near the Black Canyon of the Gunnison, and the seat of Delta County. Once part of the original Ute Reservation, it was settled by whites in 1881 and incorporated in 1882. The city government is the council-manager form. Pop. (1950) 4,097.

DELTA, the name of the fourth letter of the Greek alphabet, the capital form of which is an equilateral triangle. The name is also applied to a tract of land triangular in shape, generally formed by the deposit of river sediment, especially at the mouths of rivers which flow into lakes or seas. A mountain stream changing the force and rapidity of its current upon entering a level plateau deposits at the base of the mountain sediment which assumes the triangular form and is called a cone delta or a fan delta, or an alluvial fan.

The nature of the current in the body of water receiving the river deposit has much to do with the size of the delta. A swiftly-flowing current or high tides carry off the deposit from the shore line, sometimes forming long coast islands or sand bars or sandpits or distributing the sediment over the ocean bed; but slowly moving waters are conducive to large deltas. The almost tide-

less Mediterranean and Gulf of Mexico have deltas at the mouths of the large rivers which bring deposits to the sea. Usually the finest particles of land waste are swept away by currents, but the rest accumulates at the mouth of the river and builds up a fan-shaped land mass, or delta, in front of the old shore line. Old rivers that bring down much sediment, may, if the coast is neither uplifted nor depressed, build deltas of great size. In the case of a river emptying into a sea even the fine waste brought down falls to the bottom before long, as the salts in the sea water precipitate matter in suspension. The river usually enters the sea over the front of its delta by several channels, these branches of the main stream being called distributaries. An excellent example is the way the Mississippi divides up at its mouth. As a large river bringing down waste can build a delta even where waves and tidal currents are active in distributing the material, the absence of a delta at the mouth of a large river indicates generally some recent change of level. Thus the absence of deltas along the Atlantic coast of the United States is due to a slow depression of the coast, still in progress. This submergence of the coast has a tendency to create estuaries at the mouths of rivers. Some notable deltas are those of the Po, Hwang Ho, Ganges, and Niger. As showing how rapidly a delta may grow, Adria in Italy was a seaport in the time of Augustus, but the growth of the Po delta has left it 14 miles inland. The Mississippi delta is, in area, about 12,500 square miles; that of the Nile about 10,000 square miles. Large rivers frequently change the channel of their distributaries, thus making the deltas unsafe for dwelling places.

DELTA CEPHEI, *dě'l'tā sē'fē-ī*, is a variable star with a period of 5.37 days, its magnitude varying from 3.8 to 4.6. Its distance is given as 650 light years, but is quite uncertain. It gives its name to the class of variables known as Cepheids. Thanks to the period-luminosity law, derived from observations of their light changes, a method was devised, described elsewhere, by which the distance of any star cluster or galaxy containing Cepheids may be determined. Thanks to this, not only has the size of our own galaxy been found but also the distances of others, hopelessly too great for other known methods to measure. See COSMOGONY.

C. P. OLIVIER.

DELTA METAL, a series of bronze alloys containing mainly copper and zinc, with small amounts of iron, lead, or manganese. These alloys are recognized for their excellent corrosion-resistance and high-strength characteristics, and are used for such applications as pumps, piston rods, shafts, and valves. They are the products of Delta Metal Co., Ltd., London, England, and are available in the United States through the Phosphor Bronze Smelting Co., Philadelphia, Pa.

ALVIN S. COHAN.

DELUC, *dē-lūk'*, **Jean André**, Swiss geologist and physicist: b. Geneva, Switzerland, Feb. 8, 1727; d. Windsor, England, Nov. 7, 1817. He passed the first half of his life chiefly in commercial and political pursuits. In 1773 he went to England, where he was appointed reader to Queen Charlotte Sophia and elected to the Royal Society of London. He made geological excursions

in continental Europe and in England. He wrote works such as *Lettres physiques et morales sur les montagnes et sur l'histoire de la terre et de l'homme* (1778; enlarged ed. 1779) and *Lettres à Blumenbach sur l'histoire physique de la Terre* (1798), and sought to reconcile science with the Biblical account of creation by interpreting the Biblical "days" as epochs. He invented a hygrometer, is credited with invention of the dry pile, and devised rules for determining mountain heights by means of the barometer. His other publications include *Recherches sur les modifications de l'atmosphère*, published in 2 volumes in the first edition (1772) and in four in the second (1784); *Nouvelles idées sur la météorologie* (1787); *Précis de la philosophie de Bacon*, 2 vols. (1802); and *Traité élémentaire de géologie* (1809).

DELUGE, **The** (through the French, from Latin *diluvium*, "flood"), according to tradition, a great flood that once covered the earth and destroyed all living things except Noah, his family, and the forms of life which he saved by constructing a great ship ("the Ark"). This tradition, recounted in the Bible (Genesis 6-9), was generally accepted in the Western World as the great event in prehistory which divided the pre-flood period, characterized by giants, from the post-flood age, which is our own and in which people are of normal stature. During the 19th century, however, the developing science of geology and the discovery of fossils of extinct forms of life, with primitive artifacts, in successive rock strata, indicated a more complicated and extensive prehistory than had been conceived. While conservative people continued to believe that fossils, so extensively found over the earth and even on high mountains, were proof of the Flood, the publication of Sir Charles Lyell's *The Antiquity of Man* (1863), Thomas H. Huxley's *Zoological Evidences as to Man's Place in Nature* (1863), and Darwin's *The Descent of Man and Selection in Relation to Sex* (1871) contributed a new theory regarding the origin and history of man in the natural world. This theory marked a new era in man's understanding of himself and his past history.

In 1872 George Smith, who had been working on the Assyrian documents found in 1853 by the British excavators of Nineveh, announced that he had discovered an ancient Mesopotamian version of the Flood story, one on which the biblical account was dependent. That the Babylonians possessed a Flood tradition had long been known from the writings of a Babylonian named Berosus (3d century B.C.), fragments of whose work were quoted by the later historians, Josephus and Eusebius. George Smith, we now know, had discovered in the library of Ashurbanipal (7th century B.C.) a portion of a much longer composition, the *Gilgamesh Epic*. The Flood (or Deluge) Tablet (no. 11) of this work is in an almost perfect state of preservation, the other 11 tablets having survived in a variety of fragments. The Assyrian version can now be supplemented, however, by fragments of an older Babylonian version (first half of the second millennium), as well as by fragments in Accadian and Hittite from the capital of the Hittite empire, Bogazköy in Asia Minor, and also by a fragment in Hurrian. The Accadian form of the story is a remarkable literary creation which borrowed many of its motifs, including that of the Flood, from still earlier

Sumerian traditions. Indeed, one tablet of the Sumerian version has been found and is now in the University Museum, Philadelphia.

The Accadian story is that of a hero in search of eternal life and in bitter protest against death. This hero, Gilgamesh, a king of the city of Erech in southern Babylonia, was a giant of a man who is said to have been two thirds god and one third human. A friend and companion, named Enkidu, was created for him by the gods, in order that his exuberance might be expressed in a variety of escapades that would release the people of the city and grant them a measure of peace. All went well until the pair had slain the monster Humbaba, the Bull of Heaven. This angered the fertility goddess, Ishtar, who prevailed upon the divine council to decree Enkidu's death as a penalty. Gilgamesh was inconsolable, and he determined to find life which has no death. He set out on a long and terrible journey to the land of the living. At last he obtained passage over the Waters of Death and was able to interview the only mortal who had ever attained life there, one Ut-napishtim (also called Atrahasis, meaning "Exceeding Wise"). But the latter could not help him, for the circumstances by which he had gained life were unique and never to be repeated. When he was king of the city of Shuruppak in ancient times, the gods had decided upon a flood. (The reason for the decision is not given, though another story, the Atrahasis myth, says that the god Enlil had rashly decided upon the flood because the noise of mankind disturbed his sleep.) Ea, the wise counsellor of the gods, informed him of what was to happen, told him to build a ship and take aboard "the seed of all living things." This he did; and after the flood had subsided, Ea pacified Enlil, who then granted him and his wife eternal life. As Gilgamesh was about to leave Ut-napishtim, the latter told him about a rejuvenating plant at the bottom of the sea. Gilgamesh obtained it, only to have it stolen from him by a snake. The poem ends on a bitter note, with Gilgamesh lamenting his labors, which have brought benefit to none but the snake.

Various details of the Mesopotamian story of the Flood are so similar to those in the Biblical account that there can be no doubt about the dependence of the latter upon the former. The overall theme of the traditional tale is very different, however, in the two versions. Not only does the Bible remove the polytheistic setting of the story, but the central theme is no longer eternal life. (The hero of the Biblical Flood, Noah, dies in due course.) Instead, the story is used to depict the righteousness of God in his historical dealing with mankind. Sin is severely punished in history, though a remnant is saved to mark a new beginning.

Much has been written about the historical background of the tradition, particularly since the publication of Sir Charles Leonard Woolley's *Ur of the Chaldees* (1929). This archaeologist discovered a water-laid deposit at Ur some ten feet thick in the middle of the Obaid period of the fourth millennium B.C. This, he claimed, was conclusive evidence of the Flood. Yet in only two of the five pits which Woolley dug to virgin soil did he find the "flood" layer. This suggests that the flood in question did not cover the whole city; and we know that it made no break in the continuity of culture. Other cities in the Mesopotamian river valleys, notably Kish, Fara, and Nineveh, also show flood layers, though none of

them can be closely correlated in time. On the other hand, the excavators have found no such layer in Gilgamesh's own city of Erech (Warka). In other words, the Mesopotamian "flood" evidence is that of purely local inundations of the Tigris and the Euphrates rivers.

In the ancient Near East only Israel and Mesopotamia seem to have had the Flood tradition. However, the story of a great flood in which all but a select few were drowned appears in a wide variety of forms in many different cultures as widely separated as Greece and Polynesia, as Tierra del Fuego and the Arctic Circle. Some of the stories are probably exaggerations of local catastrophes or inferences drawn from local phenomena. We can only say either that the stories have all arisen in this way, or else that they have been diffused from a common tradition, which may be one of man's oldest memories from the remote period before the present land boundaries were fixed.

Bibliography.—The most recent translations of the Accadian and Sumerian myths are those of Ephraim A. Speiser and Samuel N. Kramer in *Ancient Near Eastern Texts Relating to the Old Testament*, ed. by James B. Pritchard (Princeton 1950), pp. 42 ff., 72 ff., 104 ff. For a survey of the archeological evidence, see Bright, John, "Has Archeology Found Traces of the Flood?" *The Biblical Archaeologist*, vol. 5, no. 4 (December 1942), pp. 56-62. See also Heidel, Alexander, *The Gilgamesh Epic and Old Testament Parallels* (Chicago 1946); Thompson, R. Campbell, *The Epic of Gilgamesh* (New York 1930).

G. ERNEST WRIGHT,
Department of Old Testament, McCormick Theological Seminary.

DELUGE TABLET or DELUGE TABLETS, a name applying in the singular to Tablet XI of the Mesopotamian Gilgamesh Epic, which in its 7th century Assyrian version was written on twelve tablets (thus the plural). See **DELUGE, THE**.

DELUNDUNG (native name), the linsang or weasel-cat (*Prionodon gracilis*), a small quadruped inhabiting the vast forests of the eastern extremities of Java and Malacca. It is of pale yellowish-white color, with elegantly marked stripes and bands of a deep brown. It is allied to the civets, but is destitute of a scentpouch.

DELUSION, an untenable belief held in spite of all evidence to indicate its falsity. Accounts of delusions are found in ancient writings. Nebuchadnezzar "did eat grass as oxen" (Daniel 4:33); Ajax, deluded into thinking that a flock of sheep were his enemies, killed them; Lucretius (in *De Rerum Natura*) describes a merchant of Argos who was often seen applauding as if in the theater, but who at other times acted normally. Persons who carried out activities prompted by delusions were either looked upon with superstitious awe or regarded as being possessed by demons.

With the rise of medical science during the 19th century, interest first centered upon the classification of various types of delusions. Sir Thomas Smith Clouston (1840-1915), who organized the material about delusions, listed more than a hundred separate types. A few of his old terms were still being used by psychiatrists in 1954. Delusions may be classified as expansive or grandiose; as depressive, in which the patient typically has delusions about having committed the unpardonable sin, about being a victim of a dreadful disease, or about being in dire poverty;

as persecutory; or as nihilistic, in which the patient may disbelieve in his own existence. They may be regarded as transitory or permanent, as bizarre or internally consistent, and as unsystematized or systematized. During the period when psychiatrists were keenly interested in nosology (the classification of disorders), there were accounts of mixed types of delusions. Thus, a patient might be described as being afflicted with both persecutory and grandiose delusions at the same time. Similarly, delusions of reference, in which the patient interprets any chance behavior as pertaining to himself, may be combined with erotic delusions. Obviously, schemata for classifying delusions are likely to become involved and confusing.

Sigmund Freud (q.v.) directed attention to the psychodynamics which lie behind the delusions. No longer does attention focus upon the problem of classifying delusions, but rather upon attempts to discover the needs in the mind of the individual patient which led to the adoption of fallacious beliefs. Consequently, the psychiatrist looks for the emotional determinants of delusions. Much of the thinking of normal individuals may be affected by the "wish to believe." The case history of a deluded patient may contain data about the prepsychotic life which indicate that wishes, anxieties, and personal difficulties operated even then to distort the reasoning processes. In many patients it is difficult to comprehend the motivations which lie behind deluded behavior, and much is left to speculation or intuition on the part of the psychiatrist. It is of moment to note that certain delusions, particularly in schizophrenia, seem to make their appearance with tragic suddenness; other delusions have a long history in the patient's life.

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PHILIP L. HARRIMAN,
Department of Psychology, Bucknell University.

DEMADES, dê-mă'dêz, Athenian orator and politician, flourished 350–319 B.C. In 338, after the Battle of Chaeronea, he mediated between Athens and Philip of Macedon; and in 335 between Athens and Alexander the Great. While Alexander was absent from Greece he held power together with Phocion and secured the deification of Alexander. Later, he was instrumental in bringing about the deaths of Demosthenes and Hyperides. For intriguing with Antogonus I of Macedonia he was himself executed at the order of Cassander. He was known for his extemporaneous oratory, but nothing survives of his speeches except some vivid phrases.

DEMAGOGUE (from Gr. *demos*, the people, and *agogos*, leading, from *agein*, to lead), one who leads or directs the people in political matters. In its original acceptation it was considered an honorable designation, and in this sense Pericles, Demosthenes, and Cicero were demagogues. On the other hand, the tanner, Cleon, satirized by Aristophanes in his play *The Knights*, is a portrait of the person to whom the epithet in its unflattering sense is applied. In modern usage "demagogue" is most frequently a descriptive term representing an orator or political agitator generally agreed to be currying popularity and power by pandering to ignorance and prejudice, but the term is also used to express personal re-

jection of a politician with whose views one does not agree.

DEMAND, in law, a claim or assertion of a right, usually made in a court proceeding or by some other formal method established by statute, common law or custom. It is a word which has many specialized meanings, depending upon the context, and among the branches of law in which it appears as a significant term are banking, negotiable instruments, insurance, landlord and tenant, decedents' estates, taxation, eminent domain, and bankruptcy. A demand is approximately synonymous to a claim, but is sometimes distinguished from the latter as being peremptory, rather than tentative, and presupposing that there is no defense or doubt as to the question of right. The word may also be used to denote any cause of action or legally enforceable right, and in this sense is related to, but more comprehensive than, debt (q.v.).

In the law relating to negotiable instruments, demand for payment, accompanying presentment of the instrument, is a formality which must be carried out before the drawer or the indorser can be held liable. Presentment and demand are not necessary, on the other hand, in order to hold the maker or acceptor liable, since he is the person who is "primarily liable" (that is, who is required by the terms of the instrument to pay it). As a general rule, personal attendance with possession and exhibition of the paper is necessary to constitute a legally adequate demand for payment of a negotiable instrument. In the law of banking, a demand is ordinarily a prerequisite to the maintenance of an action by a depositor for the repayment of his deposit. Except in unusual circumstances, such as the closing of a bank due to insolvency, a demand for a deposit is made by check or its equivalent during business hours.

In the law of insurance, demand may mean a formal notification that the insurance company intends to enforce certain conditions in the policy, such as a provision that the insured shall furnish proofs of loss or submit to an appraisal. The term may also denote an assertion by the insured of a right under the insurance contract and a request for compliance with the terms of the policy.

RICHARD L. HIRSHBERG.

DEMAND AND SUPPLY. See SUPPLY AND DEMAND.

DEMARATUS, dê-mă'ră'tūs, Spartan king of the Eurypontid line: flourished 500 B.C. As king from about 510 to 491 B.C., he was the colleague of Cleomenes I. He obstructed Cleomenes in the latter's attempt to restore Hippas (506) and in his attempt to punish Aegina for its submission to Darius I. His legitimacy questioned, he was dethroned by Cleomenes in favor of Leotychides. He fled to Asia Minor, and after taking part in Xerxes I's expedition of 480, lived there until he died, years later.

DEMARCATION, Line of, the boundary established May 4, 1493 by Pope Alexander VI, who assigned to Spain all the lands she had discovered or might discover west of a line running from the North pole to the South, distant 100 leagues west of "any of the" Azores and Cape Verde Islands (provided such lands had not been in the actual possession of any other

Christian king or prince up to the preceding Christmas), and to Portugal, on the same conditions, all the territory she had discovered or might discover east of the said line. A dispute arising in regard to the position of the line of demarcation, the two countries concerned sent commissioners to the Spanish city of Tordesillas, and on June 7, 1494 the commissioners agreed that the line should pass, north and south, 370 leagues west of the Cape Verde Islands. A treaty negotiated at Saragossa and signed by representatives of the Spanish and Portuguese monarchs April 22, 1529, fixed the line of demarcation 297½ leagues east of the Moluccas, Spain selling for a stated sum whatever rights she had formerly claimed to possess in the Spice Islands, and agreeing for the future practically not to colonize, and expressly not to "trade there in any manner whatsoever." The Molucca Islands, the Philippines, and, indeed, the western half of Australia lay within the Portuguese assignment, as a matter of fact. Therefore the principal Spanish settlements and explorations in the Far East appear to have been made in contravention of Portugal's treaty rights. A dispute over the southwestern boundary of Brazil resulted in the abrogation of the line of demarcation and all agreements based thereon by a treaty of 1750. This treaty was also abrogated in 1761 and all disputes involved were at length settled by a new treaty in 1779. See also AMERICA, DISCOVERY AND COLONIZATION OF — *Coastal Explorers*.

DEMAREST, dēm'ā-rĕst, **William Henry Steele**, American clergyman and educator: b. Hudson, N. Y., May 12, 1863. He graduated at Rutgers College in 1883, and five years later at the New Brunswick (N. J.) Theological Seminary. Ordained in the ministry of the Reformed Church in America in 1888, he became pastor at Walden, N. Y. He resigned this pastorate in 1897 to accept a call to Catskill, N. Y., and he remained there until 1901, when he returned to the New Brunswick Theological Seminary as professor of church history. Appointed president of Rutgers College in 1905, he gave up his teaching post at the seminary the following year and continued as college head until 1924. He was elected president of the New Brunswick Theological Seminary in 1925, and he served in that capacity until retirement as emeritus in 1935. He became president of the board of directors and (in 1909) of the general synod of the Reformed Church in America. In 1928 he published *Notes on the Constitution of the Reformed Church in America*.

DEMARTEAU, dē-mār'tō, **Gilles**, French line engraver: b. Liège, 1722; d. Paris, 1776. He learned his art in Paris, and there practiced it throughout his life. His specialty was engraving in imitation of crayon drawing, a process of which he became the leading exponent of his day. He executed fine portraits, and numerous plates after François Boucher and other French artists.

DEMAS, a fellow laborer with Paul and mentioned in the New Testament three times. (Col. 4:14; Philemon 24; 2 Tim. 4:10). In the last passage he is described as having deserted the Apostle in his hour of need, when Paul was waiting for his trial before Nero, because "he loved this present world." He went

to Thessalonica which may have been his home town, it is thought. He probably never returned to his faith, for by tradition he is classified among the apostates to the faith. John Bunyan uses his name and character as a warning in his *Pilgrim's Progress*. The word Demas-like, is a word applied to a traitor who is tempted by his greed to desert his good cause.

DEMAVEND, dēm'ā-vĕnd, an extinct volcano in Iran, 18,603 feet in height, situated in the Elburz Range 40 miles northeast of Teheran and 45 miles south of the Caspian Sea. At a distance the mountain has the form of a smooth cone, and appears to slope evenly from top to bottom at an angle of 45 degrees. The cone terminates in a crater 85 yards in diameter which is nearly surrounded by jagged rocks composed partly of basalt and partly of limestone and sulphur; this sulphur is an article of commerce. The basin within the cone is almost entirely filled with snow. Around the base of the mountain are many hot springs. The first white man to ascend Demavend was William T. Thompson, who climbed it in 1837.

DEMBINSKI, dēm-bĕn'y'-skĕ, **Henryk**, Polish soldier: b. Strzalkow, near Krakow, May 3, 1791; d. Paris, France, June 13, 1864. He entered the Polish Army in 1809, and three years later participated in the French invasion of Russia. In 1825 he was elected to the Polish Diet, where he was a member of the opposition party. With outbreak of revolution in 1830 he was given the rank of brigadier general, and the next year he was appointed governor of Warsaw and commander in chief of the Polish Army. He conducted the retreat of his troops into Lithuania and, with the Russians victorious, then escaped to France. During 1833-1835 he was in the service of Mehemet Ali of Egypt, and when the Hungarians revolted in 1849 Lajos Kossuth (q.v.) appointed him commander of the insurgent forces. Defeated at Kápolna, he resigned chief command but continued to serve under his successor, Arthur von Görgey (1818-1916). When the revolution collapsed he fled to Turkey, and thence made his way to France.

DEME, dēm, a subdivision of ancient Attica and of modern Greece. The démoi were townships or hundreds, subdivisions of the phulai, and were equivalent to the Dorian *komai*, Latin *pagi*. The word really meant a country district, or a common name for divisions of the country, and in the time of Herodotus they were 100 in number in Attica (10 in each phulē), afterward 170; their origin was commonly referred to Theseus. Membership was hereditary, regardless of the location of the actual residence of the member. The word démos early came to be applied to the common people, and survives significantly in our *democracy* and *demagogue*.

DEMENTIA PRAECOX (SCHIZOPHRENIA), the commonest major mental disease and so-called mystery of psychiatry. Its etiology is in doubt and its pathology is unknown. Characterized by bizarre forms of behavior and by anomalous thinking, it also has been called the insanity of adolescents. The disease constitutes a problem of vast magnitude and accounts for about one third of all the cases in mental hospitals of the United States.

Although the cause is unknown, the disease arises in those who from early life have exhibited maladjustment to modern living conditions. Such persons display a tendency to escape from the ordinary activities of mankind and to indulge in fantasies, daydreams, and wishful thinking. Adolf Meyer (1866-1950) has called this the "shut-in" personality. Dementia praecox makes its first appearance in young adults from 18 to 25 years of age. Neither race, nor sex, nor heredity seems to exercise any direct influence upon its development.

Personality Types.—Since the early diagnosis of this comparatively common ailment is, unfortunately, not at all simple, it is well for those who study it to consider two types of personality: the extrovert and the introvert.

Extroverts.—These have been called "outward" people, that is, they are cheerful, active, and sociable, with bright and alert minds—people who get things done. They are also strong, and positive in their likes, dislikes, and opinions. In early life they are active, noisy, and expressive.

Introverts.—Introverts are the reverse of all this: they are thinkers rather than doers. They usually are cold, unresponsive, and without deep feeling for their fellow men. Often they are visionaries. All human beings tend to fall into one or other of these types and most persons possess characteristics of each. It cannot be said that one type is more desirable than the other, for both are needed in the world. Indeed, introverts are necessary in society, because many of the great discoveries, inventions, and scholarly researches stand to their credit. Dementia praecox tends to develop in those who have this shut-in propensity or schizophrenic personality.

Symptoms.—The symptoms are not at all typical and show wide variations. Most psychiatrists have agreed upon four varieties of the disease: hebephrenic, catatonic, paranoid, and simple. In each is exhibited a train of general symptoms indicative of a withdrawal from the realities of life, an erection of barriers against the workaday world, a state of interest in one's self only (introversion). A host of well-defined symptoms, some of them bizarre, may arise in the course of the disease and these are brought into positive notice by such factors as worry, emotional stress, conflict with society thrust upon the individual by enforced military service. As the disease advances, the victim becomes more and more introspective; he cannot longer pursue his occupation because of loss of interest, illogical thinking, inability to concentrate his mind on ordinary problems. He becomes heedless and wanders from place to place, often living from hand to mouth in a haphazard and tramplike existence without acknowledgement of family or other obligations.

Hebephrenic.—In the hebephrenic type there is gradual disintegration of interest, but many bodily symptoms apparently have no connection with mental disease, such as digestive disorder and nervousness. Such persons indulge frequently in silly conduct, inordinate laughter without evident cause, ridiculous gestures, and absurd speech. In a word, the individual is recognized as queer. He may have delusions—false beliefs unamenable to argument, persuasion, or experience. Such a patient, if a woman, will fancy that some unknown man is in love with her and "makes her do things." These persons manifest untidiness and become intoxicated in many in-

stances. Sometimes they pretend to be clairvoyant, or they become religious fanatics, or faddists. Hallucinations are of common occurrence. His queer behavior appears quite logical to the patient.

Catatonic.—In the catatonic type there are wide variations in the symptoms and beside the features already described there is great motor activity. Here the patient will remain sometimes in one attitude for many hours at a time. Such cases are often mute for long periods (mutism), they refuse to eat, and, if urged to any activity, exhibit resistance, so that forced feeding may be required. This is termed the stuporous stage and generally is followed by one of intense excitement. While in the stuporous stage patients have been known to withstand the most surprising tortures, nothing apparently forcing them to yield. In the violent or excitable stage occasionally is observed a wild fury, during which the patient may become exceedingly dangerous, attacking his attendants with any weapon at hand.

Paranoid.—In the paranoid variety the patient seems to be at his best, since some sort of compromise is made. Usually he forms a more or less logical defense, so that, to a certain extent, he can get along with society, if mostly on his own terms. Not until such a person reacts violently to external sources or irritation will he precipitate trouble and perhaps be incarcerated. Often he is able to lead a sheltered life and, if watched and shielded from conflict, he may appear fairly normal to an average observer. The milder cases generally believe that certain agencies or societies are banded together against them. Sometimes they fancy that they are being wronged or persecuted by government agents or political parties. Inasmuch as many of them exhibit a certain coherency of personality and reasonably good logic, although antagonistic, few nonprofessional persons will regard them as sick, even if they are considered as difficult. In this type of dementia praecox the presence of delusions other than those of persecution and the presence of hallucinations will differentiate the condition from true paranoia, a rare disease.

Simple.—The last well-recognized form of dementia praecox is known as the simple type, in which, from the outset, there is gradual and progressive mental deterioration with apathy and loss of all interest in outside affairs. Toward the end neither hallucinations nor delusions are present. Such patients assume an attitude of meditation and complete indifference.

Diagnosis.—With regard to differential diagnosis there is but one other mental disorder which may be confused with dementia praecox: manic-depressive psychosis. In the former the general behavior is odd and incongruous, the speech irrelevant, silly, and oftentimes incoherent. In the latter there is apt to be a flight of ideas, with marked distraction and restlessness in the manic stage, and with slowness of thought and depression of spirits in the depressed stage. In dementia praecox both delusions and hallucinations are common, while in manic-depressive psychosis there are expansive ideas but no hallucinations. Insight is absent in dementia praecox.

Prognosis.—The prognosis, in dementia praecox or in any type of schizophrenic (split) personality disorder, is uncertain. It should be borne in mind that there are two aspects of recovery: spontaneous cure and adjustment of the patient to the ordinary ways of life, in which

recovery is more apparent than real. Remission of symptoms certainly occurs, with what appears to be actual recovery. More often a mental storm will be succeeded by a period in which behavior may be entirely normal, and there will ensue another episode; the progress of the disease, in the great majority of cases, goes from bad to worse. In the ordinary case, presenting full-blown and unmistakable symptoms, there is little ground for optimism. If deterioration of personality is not evident, the outlook may not be at all hopeless. Psychiatrists believe that the transmissional stage from reality (sanity) to unreality (mental disease) is critical. Here inhibition may be lost or at least materially lessened and incidents may at the time be impressed deeply upon the mind, so that they become elaborated into what, for want of a better term, are known as malignant or incurable symptoms. Occasionally toxic conditions or even exhaustion may complicate what seems to be a benign psychosis, so that for a time mental deterioration may be simulated closely. The presence of catatonic or stuporous states does not necessarily indicate a deteriorating process, if they do not recur. Before rendering an opinion as to prognosis, a case should receive long and intensive study both of the actual symptoms exhibited and of the antecedent factors which have had a part in molding the expression of the psychosis itself.

Treatment.—The treatment of dementia praecox is concerned with prevention as well as with actual care of the individual case. Under preventive measures should be mentioned studies of childhood psychology and mental hygiene in the home and in the school. Good habits of thinking should be taught, instruction in sex matters should receive personal attention, and regard should be paid to the necessity of waking the daydreamers and encouraging them to take an active part in everyday programs. Such safeguards should be erected before it is too late, which is at the point at which the schizophrenic process becomes manifest. When the symptoms are sufficiently definite so as to be recognized for what they are, it may be extremely difficult to treat the individual with success.

The treatment of the already developed case is somewhat complicated. The patient must be safeguarded during outbreaks, not only to prevent his self-destruction, but also to protect the community. This will necessitate, generally, his transfer to a mental institution or hospital. The general care of the patient is important, since intercurrent disease may exist. Psychoanalytical measures may help and occupational therapy is most important. The statement sometimes made that mental ills can be treated best by talking with the patient, giving him insulin shock, and administering drugs, some of them new, is not entirely accurate, since it groups together dementia praecox, manic-depressive psychosis, and psychoneuroses. These diseases differ in origin, in course, and in prognosis; and what will be effective in one case will not serve in another.

After the psychosis has been established, many patients must be committed to institutions. Insulin shock, which was used first in Vienna about 1930, requires a careful survey of the patient with studies of blood and estimation of sugar tolerance. The treatment is to inject 15 to 30 units of insulin deep into a muscle one to three times a day. This is repeated every second day until there is indication of oncoming coma. After

that the dose is given once a day until the expected effect is reached. Other doses may be in reduced amounts. Continuation of shock must not be interrupted until the proper effect has been secured or the treatment has been abandoned. Another method, employed first in the 18th century, when camphor was administered in a poisonous dose, is to induce chemically produced convulsions. Metrazol, long used in the treatment of barbitol poisoning, is used with good effect.

If any of these measures secures complete remission of symptoms, the outcome is most fortunate.

HAROLD WELLINGTON JONES, M.D.

DEMERARA, dēm-ě-râr'ă, river, British Guiana, rises in the unexplored mountains of the interior, flows northward and empties into the Atlantic Ocean at Georgetown. It is navigable for small vessels to a point about 100 miles above its mouth. The estuary of the Demerara forms a moderately good harbor. See also GEORGETOWN.

DEMETER, dê-mě'tēr, one of the twelve principal Grecian deities, the great mother-goddess, the nourishing and fertilizing principle of nature. She was the daughter of Cronus and Rhea, and mother of Persephone (often called Cora, the Maiden, the Proserpina of Roman mythology), and according to Hesiod, of Dionysus (Bacchus). By the Romans she was identified and worshipped with Ceres (q.v.).

DEMETER, Dimitrija, dê-mě-trě'zhâ dê-mě'tēr, Croatian dramatist and poet: b. Agram (now Zagreb), in Croatia, July 21, 1811; d. there, June 24, 1872. His principal dramas are *Love and Duty*; *Blood Revenge*; and the tragedy *Tenta*. He wrote a lyric-epic poem, *The Battlefield of Grobnik*, and many stories, and translated into Croatian several foreign dramatic works.

DEMETRIUS, dê-mě-tri'ūs, Greek king of Bactria, ancient country of southwest Asia, later known as Balkh, now part of Afghanistan: fl. about 206–175 B.C.; r. about 190–175 B.C. Son of Euthydemus, king of Bactria shortly after it became an independent kingdom about 250 B.C., Demetrius signed a peace with Antiochus III the Great of Syria, who had invaded Bactria about 205. Later Demetrius seized the Gandhara region of India from Antiochus and about 185 invaded the Punjab and the valley of the Indus and Kabul rivers. Civil war in Bactria, in which Eucratides usurped Demetrius' power, halted expansion of the Bactrians into India after the Greco-Bactrians, through soldier-philosopher Menander, had set up a strong dynasty at Kabul.

DEMETRIUS, name of two kings of ancient Macedonia:

DEMETRIUS I (surnamed Poliorcetes, pōl-ī-ōr-sē'tēz, "besieger"): b. 337? B.C.; d. Pella, Syria, 283 B.C. In his constant warfare against Egypt he was defeated by Ptolemy I in 312 at Gaza, but shortly after was victorious over Ciltes in Syria. With a fleet of 250 ships he wrested Athens from Ptolemy and Cassander (307 B.C.), and became a hero to the freed Athenians. After destroying the naval power of Egypt at Cyprus (306), he besieged Rhodes but failed to take that capital, despite the novel stratagems he used; this siege is the origin of his appellation. De-



feated in a battle at Ipsus against Cassander, Lysimachus, and Seleucus (301), he lost Athens, but regained it in 295. He conquered Macedonia (294), reigned there for seven years, but lost the throne when his old enemies rose against him. He surrendered to Seleucus and remained prisoner until his death. His story is told in Plutarch's *Lives*.

DEMETRIUS II, grandson of the above: b. 278? B.C.; d. 229 B.C. While still a young man he saved Macedonia from invasion by Alexander of Epirus, and thereafter had to defend his kingdom from wild northern tribes while fighting off a coalition of the two great Achæan and Aetolian leagues bent on upsetting his power. He ruled from 239 to 229 B.C.

DEMETRIUS (Russ. DMITRI or DIMITRI), the name of one of the sons of Ivan IV Vasilievich (Ivan the Terrible), czar of Russia, and of four pretenders to the Russian throne in the early years of the 17th century. The period 1604–1613, when these impostors were most active, is known as the "Time of Troubles." The careers of all the false usurpers are based on the assassination, or supposed assassination, of Ivan's son Dmitri at the age of 10 on orders of Boris Godunov, a favorite of Ivan and later regent and czar of Russia.

The first usurper, DEMETRIUS I (usually called PSEUDO-DEMETRIUS), after enlisting the support of King Sigismund III of Poland and of a Lithuanian prince, invaded Russia in 1604, while Boris was czar, and defeated and then won over the bulk of the Russian forces. Following the sudden death of Boris in April 1605 (some say by poison), the self-styled Dmitri became czar. He carried out various economic and political reforms, helped the peasants, and worked for religious tolerance, but his rule lasted less than a year. A revolt led by the boyars or landed gentry, who opposed his Westernism and his pro-Polish policies (he married Marina, daughter of a Polish magnate who had supported his cause), culminated in his slaying in Moscow in May 1606.

The second usurper, DEMETRIUS II, moving upon Moscow in 1608, overcame the army of Czar Basil IV Shuiski and, forcing Marina to acknowledge him as her husband, won partial allegiance and the support of the Don Cossacks until routed by King Sigismund. He was killed in December 1610 after an unsuccessful attack on Moscow.

Demetrius III and IV, pretenders, claimed to be sons of Demetrius II. Apparently with the support of Cossack groups, both created considerable disturbance. One is said to have been murdered in 1612, or earlier; the other was executed in Moscow in 1613. For many years after, a number of other false Dmitris appeared from different quarters.

Consult Munro, H. H., *The Rise of the Russian Empire* (London 1900); *Cambridge Modern History*, chap. 10 (Cambridge 1907).

DEMETRIUS, name of three kings of Syria:

DEMETRIUS I (surnamed SOTER, sō'tēr, "preserver" or "savior"): b. 187 B.C.; d. 150 B.C. Escaping from Rome, where he had been held hostage, he regained his father's throne in 162 B.C. and freed Babylon from the tyrannical rule of Timarchus, thus earning the title of savior. He warred against the Maccabean Jews in their

fight for freedom, invading Judea in 160, and fell in battle against Alexander Balas (150), who thus became king of Syria and Babylonia.

DEMETRIUS II (surnamed Nicator, nī-kā'tōr, "conqueror"): d. about 125 B.C. Son of Demetrius Soter, he reigned 145–139 and 129–125 B.C. With the support of Ptolemy Philometor, king of Egypt, he defeated the usurper Alexander Balas and ascended the throne of Syria in 145 B.C. The country, torn by dissension, was held partly by Demetrius II and partly by the Syrian Greeks, who had revolted and set up the infant son of Balas as king (Antiochus VI). Demetrius Nicator made concessions to the Jews and helped Judea gain independence. Leading an expedition to free Babylon from the Parthians, he was captured by Mithridates I about 139, but regained the throne ten years later and ruled for four years until he lost his life in civil war.

DEMETRIUS III (surnamed EUKAIROS, ū-kī'rōs, "the fortunate," and PHILOMETOR, fil-ō-mē'tōr, "loving his mother"): d. 88? or 87? B.C. Grandson of Demetrius Nicator, Demetrius III in 95 B.C. wrested Damascus from his cousin Antiochus X. Then until 88 he reigned over Syria jointly with his brother Philip, each disputing the other's rule in a chronic civil war. Demetrius III is said to have aided the insurgent Jews against Jannæus. Conquered by the Arabs and Parthians, he was sent as a prisoner to Mithridates II, king of Parthia, in the year 88 or 87 B.C.

DEMETRIUS DUNSKOI, dūn-skoī' (Russ. DIMITRI DONSKOI), Russian grand duke: b. 1350; d. 1389. Son of grand duke Ivan II Krasny ("the Red"), he ascended the princely throne of Moscow and Vladimir at the age of 9. He built the Kremlin, central citadel of Moscow, and through constant struggles against his chief rival Michael, prince of Tver principality, did much toward creating a Russian national state with Moscow as the center of political supremacy.

At the same time Demetrius rallied together the various principalities to overthrow the Tatar invaders, whose power, with the support of Lithuania, was still considerable. On Sept. 8, 1380, in the famous Battle of Kulikovo, a plain near the source of the Don River, Demetrius routed the Tatars. Though they returned the following year to win a battle under leadership of Toktamish, a lieutenant of the Mongol conqueror Tamerlane, and even entered Moscow, their defeat at Kulikovo proved a turning point in Russian history, marking the gradual ebb of the Tatar tide.

DEMETRIUS PHALEREUS, fā-lē'rōos, Greek orator, philosopher, and statesman: b. Phaleron or Phalerum, Attica, about 345 B.C.; d. Upper Egypt, about 283 B.C. He was appointed Macedonian governor of Athens (317) and archon (309). He embellished the city with magnificent buildings, and the grateful though fickle Athenians erected many statues of him, which they demolished, condemning him to death, when Demetrius I Poliorcetes conquered Athens in 307. Phalereus fled to Egypt, where he enjoyed the protection of Ptolemy Soter, to whom he is said to have suggested the establishment of the great library at Alexandria. Upon the accession of Ptolemy Philadelphus, however, Phalereus fell into disgrace and was banished to a remote fortress in Upper Egypt, where he died from the bite of an asp. Phalereus was among the most learned of the Peripatetics, writing on philosophy,

history, poetry, and political science; none of his work has survived.

Consult Wright, J. H., *A Short History of Greek Literature* (New York 1907).

DEMETRIUS THE CYNIC, Greek Cynic philosopher, fl. 1st century A.D. One of a group of "itinerant moralists" variously called Cynics, Stoics, philosophers, or astrologers who went about Rome preaching anarchy and subversive opposition to all rulers. Demetrius was a thorn in the flesh to three Roman emperors—Caligula (r. 37–41 A.D.), Nero (r. 54–68), and Vespasian (r. 69–79). Angered by his constant and bitter attacks, Vespasian in 71 banished Demetrius and similar critics from Rome. Undaunted, Demetrius continued his barbs from outside the capital, leading the exasperated monarch to cry, "You are doing your utmost to get yourself killed by me, but I don't kill dogs for barking."

Consult *The Cambridge Ancient History*, vol. 11 (Cambridge and New York 1936).

DEMETZ, dē-měts', **Frédéric Auguste**, French philanthropist and prison reformer: b. Paris, France, May 12, 1796; d. there, Nov. 22, 1873. He was judge, vice president of the chamber of correctional police, and court councilor. In 1840 he founded the agricultural and penitentiary Colony of Mettray for juvenile delinquents, devoting himself wholly to this establishment, which has served as a model in France and elsewhere. He was elected corresponding member of the Academy of Moral and Political Sciences, Paris, in 1864. He wrote many essays and reports on prison methods and reform, among them a study of United States prisons which he undertook for the French government in 1836.

DEMI RELIEF or **DEMIRILIEVO**, rē-lē'vō, a term applied to sculpture projecting moderately from the face of a wall; half raised, as if cut in two, and half only fixed to the plane. Mezzo-rilievo, which is the more correct term used to designate this style of sculpture, is lower than alto-rilievo and higher than basso-rilievo.

DEMIDOV, dyě-myě'dōf, or **DEMIDOFF**, a noble Russian family, whose head, Nikita Demidov, was an armory-founder at Toul. This Demidov was entrusted by Peter the Great with the business of casting the cannon for that prince's numerous warlike expeditions. He actively seconded all the exertions of the czar, by whom he was ennobled, and in 1725 discovered the mines of Kolyvan, the working of which speedily enriched him. He left a son, Akinfi, and several grandsons, who distinguished themselves in the same career as their progenitor and amassed colossal fortunes. The best known of these are Prokop Demidov, who worked with great profit the iron, copper and gold mines of the Ural Mountains; Nikolai Nikitch (about 1774–1828), a zealous philanthropist, who introduced into his country several branches of industry, founded establishments of public utility and carried to a great state of perfection the working of mines. He had an annual income of more than \$1,000,000. His last years he passed in France and Italy, enjoying the society of learned men and heaping benefits on all around him. He left two sons, Pavel and Anatóli, who, as well as inheriting his fortune,

had also the same high taste and benevolence. The latter married Princess Matilde, daughter of Jérôme Bonaparte.

DEMIJOHN, a jug in a wickerwork casing or box, used for holding liquor.

DE MILLE, **Henry Churchill**, American playwright: b. Washington, N. C., Sept. 17, 1853; d. Pompton, N. J., Feb. 10, 1893. He was graduated at Columbia College, and was by turns preacher and teacher till 1882, when he became reader of plays at the Madison Square Theatre, and later for a short time an actor. His first successful play was the *Main Line*, in which he collaborated with Charles Barnard. In 1887, having become associated with David Belasco, he wrote the society dramas *The Wife* (1887); *Lord Chumley* (1888); *The Charity Ball* (1889); *Men and Women* (1890). His last work was a melodrama adapted from the German, entitled *Lost Paradise*, which was successfully produced in 1892.

DE MILLE, **James**, Canadian novelist: b. Saint John, N. B., Aug. 23, 1836; d. Halifax, N. S., Jan. 28, 1880. He was graduated at Brown College in 1854. He was professor of classics in Acadia College (1860–1865), and of history and rhetoric in Dalhousie College, Halifax, from 1865 until his death. Among his publications are *Andy O'Hara* (1860); *The Soldier and the Spy* (1865); *The Dodge Club* (1866); *Cord and Creese* (1867); *The American Baron* (1870); *The Lady of the Ice* (1870); *A Comedy of Terrors* (1872); *The Living Link* (1874); *A Castle in Spain* (1882–1883); *The Winged Lion* (1877; 2d ed., 1904), and many books for boys, including *Treasures of the Sea*. A posthumous work, *A Strange Manuscript Found in a Copper Cylinder*, appeared in 1888. A treatise of his on rhetoric was published in 1878.

DE MILLE, **William Churchill**, American playwright: b. Washington, N. C., July 25, 1878. He was graduated at Columbia University in 1900, and received his diploma from the American Academy of Dramatics in 1901. His plays include *Strongheart* (1905); *The Warrens of Virginia* (1907); *The Land of the Free* (1912); *The Woman* (1912); *The Forest Ring* (1914); co-author: *Classmates*; *The Royal Mounted*.

DEMING, **Philander**, American lawyer and author: b. Carlisle, N. Y., Feb. 6, 1829; d. Albany, N. Y., Feb. 9, 1915. He was graduated at the University of Vermont 1861, and at the Albany Law School. From 1878–1879 he was president of the New York State Law Stenographers' Association. He began to write stories for the magazines in 1873, and his published books include *Adirondack Stories*; *Tompkins and Other Folks*.

DEMING, village, New Mexico, resort, and Luna County seat; altitude 4,342 feet; in the Mimbres River valley; 85 miles northwest of El Paso, Texas; on the Santa Fe, and Southern Pacific railroads. For many years it was a small center for widely scattered cattle ranges and mining districts. In the Florida Mountains to the southwest manganese is mined, fluorspar is found northeast of Deming, lead and zinc in the Cook's Peak district, and gold, silver, copper,

and onyx in the Tres Hermanas Mountains to the south. Tomatoes and fruit are raised on irrigated land, and there is good grazing for horses, cattle, hogs, and goats. Yucca grown in the vicinity is processed for a fiber used in binder twine, cord, upholstery, and bagging. Deming was incorporated in 1902. Pop. (1950) 5,672.

DEMISE, dê-miz', a transfer of an estate by means of a lease or by a will in fee simple or for a specified number of years or for life. The word *demise* in a lease implies an absolute covenant on the part of the lessor for the lessee's peaceable enjoyment during the term. As applied to the crown of England, *demise* signifies the transmission of the rights and properties of sovereignty to the next heir on the death or abdication of the sovereign.

DEMIURGE, dêm'î-ûrj (Greek, *dēmiourgos*, a handicraftsman or worker for the people), was the designation applied by Plato in the *Timaeus* and by other philosophers to the Divine Being, considered as the Architect or Creator of the universe. The Gnostics made a distinction between the Demiurge and the Supreme Being, the former corresponding to the Jehovah of the Jews; although deserving to be honored as the Creator, the Demiurge was only the instrument of the Most High who had established the moral order of the universe and created the rational soul in man. The origin of evil was sometimes attributed to the Demiurge.

In some of the Peloponnesian states of ancient Greece the name *demiurge* seems to have been given to a chief magistrate, probably corresponding to the Roman tribune. In the Achaean League this official ranked next to the strategoi or generals.

DEMOCRACY, The Nature and History of. Democracy is one of the most controversial of concepts. Not only does it have powerful enemies, but even its friends do not always agree about what they are defending. Beyond the common idea that democracy is the popular control of government there is no universally accepted definition, and the concept is complicated by various secondary meanings, common after the Industrial Revolution, such as "social and economic democracy" and democracy as an ideology or total "way of life." History discloses three conflicting types of political democracy. These types, as well as the secondary meanings of democracy, are discussed below, followed by a historical account of the democratic tradition of ideas and institutions.

Political Democracy.—The forms of democracy are vitally distinguished by the particular ways in which the people participate in and control politics. *Direct democracy*, in the strict sense of popular deliberation, decision, and execution of policy, was practiced to an important extent only in some of the ancient Greek city-states, in some of the 1st century German tribes (according to Tacitus), in some of the oldest of the Swiss cantons, and in the New England town meetings. This type of democracy stresses the importance of immediate, unorganized public opinion and tends to identify the will of the people with majority decision. The size of modern populations and political divisions, the growth of nationalism, and the complications of industrialization have largely rendered direct democ-

racy obsolete, although its values survive in the extensive use of the devices of the initiative, the referendum, and the recall (qq.v.) in the United States and Switzerland.

The form of democracy common in the United States, the British Commonwealth of Nations, and western Europe by 1920 was *liberal democracy*, an indirect, representative, and constitutional government controlled by a multiparty system and universal adult suffrage. In this type of democracy public opinion is organized and expressed through representatives of political parties which compete at regular intervals for election to the law-making legislature and make policy through debate and majority decision within it. The majority is not equated, however, with the homogeneous will of the people, for the minority is preserved as an inherent element in the government itself. The forms of executive power vary, although typically this power is vested in a prime minister and his cabinet, who are members of the majority party in the legislature, or in an independently elected president and his appointed cabinet. The forms of judicial power vary too, but liberal democracies stress its importance, for the citizen is held to possess fundamental rights and liberties which are protected by "due process of law." The whole process of determining who shall govern and to what ends thus takes place within a constitutional framework, whether of custom, fundamental law, or separate charter. Emphasizing discussion and compromise within the political process, liberal democracies require the maintenance of freedom of expression and association in society at large as necessary conditions for the proper formation of a majority party prepared to assume responsibility for governing.

Formal democracy is, of course, no guarantee of good government; its effectiveness depends upon the political intelligence of its citizens and leaders. A heavy price is often paid for mass elections, since, as Joseph A. Schumpeter has remarked, the party leadership is generally in the situation of "a horseman who is so fully engrossed in trying to keep in the saddle that he cannot plan his ride." Democracy is easily debased by a demagoguery which exploits fears, hopes, and hates. Liberal democrats have, therefore, commonly stressed the necessity of public education for all citizens and of moderation in their leaders. But that which theory requires has not always been realized in practice, even in the most long-established democracies. Liberal critics, like Alexis de Tocqueville, have often emphasized the importance of minority and local rights, respect for intellectual and moral independence, and concern for cultural freedom and integrity as elements threatened by the centralizing, materialistic conformity often found in great democracies.

Liberal democracy has often been attacked from another quarter as a mere sham for the defense of property interests. This charge has been made by revolutionaries who claim to speak for "true" democracy. These advocates of *totalitarian democracy* defend temporary dictatorship as a necessary means to a utopian end in which anarchic freedom and material equality will finally prevail. In this process the spontaneous will of the people is assumed to be authoritative, independent of any political forms; then the minority is treated as an enemy of the majority. Thus this kind of democracy is not defined in

terms of any political or legal process, but is identified with a positive program, alleged to be the majority interest, administered by an elite—conceived of as an enlightened vanguard of the majority—and imposed on the community through force. Combining the rhetoric of liberal democracy, the idealism of socialism, the mass participation of direct democracy, and the terrorism of totalitarianism, this form of politics is a grave threat to the values of liberal democracy.

Nonpolitical Democracy.—Enemies of liberal democracy often compare it invidiously to “social and economic democracy,” but in common parlance these terms are generally vague. A few of the principles of liberal democracy, such as elected representation and majority decision, have been applied, in varying degrees, to churches, corporations, cooperatives, and labor unions. But what often passes for democracy in nonpolitical areas is really, as Alf Ross has pointed out, the socialistic principle that social, economic, or cultural benefits should be equally distributed. Whether or not this policy is wise or just, it should not be confused with democracy. Liberal democracy is a *method* of deciding what men and measures shall rule; it is not committed to a particular program. Nor is it clear to what extent its principles are applicable to nonpolitical areas. Nevertheless, if the structure of power outside politics is authoritarian, the working of political democracy is likely to be seriously affected.

Since the Industrial Revolution there has been much dispute about the proper economic milieu for democracy. Some persons, like Harold J. Laski, have maintained that only socialism is congruent with it; others, like Friedrich August von Hayek, have declared that democracy requires a market economy. Mediating this debate, others, like Joseph Schumpeter, have argued that democracy prescribes neither socialism nor free enterprise, but is, under certain conditions, compatible with either. Modern history supports the latter view, for most democracies in the 20th century have extensively regulated the market, have adopted a system of welfare benefits, and have established varying degrees of public ownership.

The standard of social democracy is generally raised against public discrimination on grounds of birth, wealth, race, or religion. Such prejudices threaten political democracy by nurturing social conflicts and tensions which make the working of political democracy precarious, for democratic politics presupposes tolerance, stability, and fundamental unity in society. Majority rule is a reasonable principle only if there are no permanent, embittered minorities and no ruthless, vindictive majorities. Some antidemocrats have argued that majority rule is always oppressive, but their appeal to minority rights is often only a defense of minority privileges. Democracy accords minorities no special rights, only the rights guaranteed to all citizens alike and the political right to try—through the democratic process—to turn themselves into an eventual majority.

The liberal democratic state is a self-limiting one, hence a system of rights, protecting individual and group activities from interference by the government, is basic to it. These rights define the area of non-political freedom in which men may freely express conflicting economic, social, and cultural purposes, provided these activities are not themselves destructive of liberty and

toleration. But in no case should the liberal state direct its force against opinions as such, however strange, dangerous, or offensive they may seem to some people—even to democrats and liberals.

Democracy as an Ideology or Way of Life.

—By some, democracy is held to be a total religion, relevant to all of life. Yet the institutions of liberal democracy have had defenders of many different faiths and philosophies, and its government, in respecting cultural pluralism, must put up with disagreement about absolutes. Traditionally, democracy has been associated with the ideals of liberty and equality; in the United States especially, it has been identified with a special concern for the common man. But the equality that is relevant to democracy is the equalizing of liberties, not of property or of souls. And, as R. M. MacIver has said, true democratic idealism respects not the average man, but the common in man, the moral worth of personality and its power to achieve independence, integrity, and dignity. From this point of view the democrat denies that any group of men, of whatever ancestry or status, has a monopoly of wisdom, virtue, or importance. It is in this sense of an ultimate respect for human personality and its potentialities that liberal democracy invokes nonpolitical premises.

Early History of Democracy.—Background.

—In the ancient world the classic expression of democracy was realized, within narrow limits, in the Athenian city-state from about 508 B.C. to 338 B.C., the period falling between the reforms of Cleisthenes and the conquest of Athens by the Macedonians. Although slaves—perhaps a third of the population—were, like women and resident foreigners, excluded from all political rights, the citizens extensively practiced direct democracy by collective meetings in the assembly to discuss and decide important matters of legislation, although the demands of work and the barriers of distance kept many citizens from attending. The steering committee for the assembly was the Council of Five Hundred, composed of 50 members from each of the 10 tribes, the component from each tribe ruling in rotation for one tenth of the annual term. Candidates for these offices were elected by the local wards, or demes, and then chosen for office by lot, not by vote. Election by voting alone was reserved for the 10 generals, who were very influential in both political and military capacities. Athenian magistrates, chosen usually in boards of 10 on a tribal basis, had little power, being restricted to short terms and made ineligible for re-election. Mass participation in politics was stressed in the system of popular courts, created by election and lot, sitting in large panels totaling 6,000 jurors a year, and empowered to review both men and laws.

Although Pericles celebrated Greek democracy in his funeral oration, the philosophers of Athens, Plato and Aristotle, identified it with the destructive domination of the poor over the rich. Their ideal was the benevolent despotism of the enlightened philosopher-king, a tradition that endured even among the *philosophes* of the 18th century Enlightenment. In practice, however, political thinkers of the classical tradition defended a mixed government as the best actual state. Renewed emphasis on the necessity for combining monarchical, aristocratic, and democratic elements in the state sprang from the experience of the Roman Republic and the writ-

ings of Polybius and Cicero. The ideal of the balanced state was also the common theme of later republicanism in the Italian Niccolò Machiavelli, the Englishman James Harrington, the Frenchman Montesquieu (Charles de Secondat), and the American John Adams.

Roots of Modern Democratic Ideas.—Modern democratic idealism developed from an individualistic and equalitarian conception of personal rights and liberties quite foreign to the Greek sense of the ultimate importance of the community. Although the Roman republican Cicero defended the equality of man on the basis of the universality of "right reason," and although the rise of Christianity nurtured the idea of equality as a spiritual brotherhood of souls before God cutting across all worldly distinctions, nevertheless, neither Roman Stoicism nor medieval Christianity affirmed democratic political values.

Such democratic political values first emerged in 1647–1650, during the crisis of the English civil wars, when a small band of Protestant independents in Oliver Cromwell's army agitated for reform of the government. These men, called Levelers and led by John Lilburne and Richard Overton, drew up "The Agreement of the People," calling for a popularly based Parliament representing individuals rather than interests, requesting religious toleration, except for Catholics, and presenting the document itself to the officers of the army as a suggested fundamental constitution. In their debate with the officers the Levelers spoke eloquently of individual "natural rights" possessed by all men equally and of the necessity for government by consent. Defeated in their reform movement, the Levelers nevertheless spoke for a point of view destined to develop into a historical force.

With James Harrington and John Locke, who were to have great influence on American political ideas and institutions, the ideal of elected, representative government was further developed. Harrington's utopia, as elaborated in his *Commonwealth of Oceana* in 1656, was based on an elected, bicameral legislature. Although a strong defender of the land-owning gentry as the life and soul of the state, he nevertheless proposed equal division of large estates among heirs, the secret ballot, rotation in office, the separation of executive and legislative powers, a written constitution, wider exercise of religious liberty (except for Catholics and Jews), and a national public school system, made compulsory and free of charge for the poor. No more than Harrington did Locke think of himself as a democrat, yet he too suggested democratic tendencies in his *Two Treatises of Government* (1690). For Locke government was established and maintained by majority decision, and its chief duty was the protection of the individual's rights to "life, liberty, and property."

Written to justify the English settlement of 1688 that brought William and Mary to the throne and made Parliament the decisive political body, Locke's essays were later used by Americans to justify their revolution against England. Although the Puritan communities had been established in America as strict theocracies, ideas of natural rights and government by majority consent gradually crept into clerical thinking, partly emerging from the town meetings and church communities, as well as from the study of European thinkers like Locke and Baron Samuel von Pufendorf. By 1717, John Wise, Congrega-

tional minister at Ipswich, Mass., had defended majority vote in a general assembly as the best government for the churches in his *Vindication of the Government of New-England Churches*. Protesting in 1687 against Governor Edmund Andros' levy of taxes without legislative consent, Wise had anticipated the ground upon which the colonists, after 1763, would erect their case against the British.

In France, before the revolution of 1789, all the conflicting strands of democratic theory were bound together in the complex skein of the mind of Jean Jacques Rousseau. Because he felt that democracy meant the direct exercise of political power in all its forms, in the tradition of Greek city-states, he believed that an approximation of democracy could be obtained only in small communities like Geneva and Corsica. England, he felt, was free only when it had elected its representatives, but not afterward. Fearful of the oligarchical influence of ruling families as he had known it in Geneva, he mistrusted representation as well as all local and subsidiary associations within the state. To this extent Rousseau's thought is quite irrelevant to modern parliamentary democracy. Yet he also set forth a theory of popular sovereignty in his concept of the General Will of the community and foreshadowed modern nationalistic self-determination. His *Social Contract* (1762) strongly emphasized majority rule and religious toleration; but his ideal state also contained the seeds of totalitarian democracy. The General Will was to be embodied in the majority, or even in a godlike Legislator, and the state was supposed to enforce a compulsory Civil Religion of patriotic citizenship. Despite his theory, however, Rousseau tended in practice to approve of aristocratic, constitutional government.

The Development of Modern Democracy.—

Introduction.—Liberal democracy has been successfully established only through a long process of growth. Its realization represents the crystallization in a modern form of institutions developed before the days of democracy: representative government, constitutionalism, civil liberties, and the organization of parties. Democrats advanced the claim of the whole community to control the state through wide electoral powers when the state had become the guarantor of rights and liberties too precious to become the preserve of any single class. In this way the forces of liberalism and democracy merged.

Rise of American Democracy.—The sources of American democracy lay in the transplanting and transforming of English constitutional government by a community free of most traditional feudal restraints. It was prophetic of future American development that its earliest political, legal, and economic forms had an English heritage, working in a society much more mobile and individualistic than that of the mother country.

In England, "the mother of parliaments," the House of Commons had emerged by 1265, but Parliament was not a regular nor a dominant body of government until after the Restoration of 1660, and it was not broadly representative until well into the 19th century. A hint of the democratic future of Parliament came in 1621 when Sir Edward Coke and Sir Thomas Wentworth challenged King James I, who had told Parliament its privileges were mere favored grants of a hereditary line of kings, alone competent to control "mysteries of state." His chal-

lengers asserted that Parliament had its own line of inheritance. "Wee serve here," Coke remonstrated, "for thousands and tenn thousands." Yet Parliament continued to represent interests of the realm, rather than persons, long after its power had become established by the "Glorious Revolution" of 1688. In the following year the Bill of Rights and the Toleration Act (q.v.) gave constitutional sanction to expanded civil liberties, although libel laws, high taxes on printed matter, and disabilities imposed on non-Anglicans restricted their scope.

For the patriot leaders of the American Revolution this English tradition of political liberty was summed up in John Locke, whose ideas seemed to them to fit the facts of their own case perfectly. By 1776 the colonists were prepared to break away from the empire in defense of their own representative institutions and local liberties. In 1763, when the quarrel with Britain had erupted, all the 13 original colonies had popular legislative assemblies and two colonies (Connecticut and Rhode Island) had elected governors. The Americans thought of their own legislatures as miniature parliaments, brooking no absentee control from England. Under the impact of the revolution (1775-1783) the colonists established new state constitutions and governments to protect and expand their traditional liberties. Bicameral legislatures, weak or popularly elected executives, and bills of rights were typical features of these constitutions. Yet the democratic sentiments for equal political rights expressed in Thomas Jefferson's Declaration of Independence, accepted by Congress on July 4, 1776, were in advance of the times. Indeed, the document remained a standard for later agitation on behalf of Negro emancipation and women's rights.

Despite the high property qualifications for political rights in the newly created constitutions, democratic growth was favored during the revolution by the confiscation of royal lands, proprietary estates, and Loyalist property; and the extensive abolition of entail and primogeniture rights to land inheritance continuing in the post-revolutionary period caused their virtual disappearance by 1791. By 1786, furthermore, the Anglican Church was disestablished in all places where it had enjoyed state support, and the slave trade had been either restricted or prohibited among the states, while five northern states had eliminated slaveholding itself. Then Congress, under the Articles of Confederation, passed the Northwest Ordinance of 1787 which provided for religious freedom, jury trial, public support of education, and prohibition of slavery in the Northwest Territory.

The framers of the federal Constitution worked primarily to strengthen the authority of the federal government over the states and citizens, to maintain a division of power between federal and state governments, and to preserve a balance of powers among the three branches of the federal government. The Constitution was ratified in 1788, after strong opposition in several states which demanded a bill of rights (q.v.). These rights were secured in 1791 as the first 10 amendments, guarantees of separation of the federal government from any church; freedom of religious exercise; freedom of speech, press, assembly, and petition; security against arbitrary search, seizure, or arrest; protection of life, liberty, and property through due process of law; and trial

by jury. The Constitution also prohibited religious or economic tests for federal officeholding and defined treason so precisely that the right of political dissent was preserved. In these respects the document reflected some of the liberal ideas of James Madison and James Wilson. In other respects the document was by no means a democratic one, for it protected slavery and deliberately did not provide for popular election of the president and Senate.

In the states, furthermore, religious and economic tests for both officeholding and suffrage were fairly common. Between 1810 and 1860, under the stimulus of state constitutional conventions and popular ratifications, pioneer statemaking in the West, and the popular enthusiasm for Jacksonian democracy, suffrage was extended to adult, white males, and more offices were made elective, including judgeships in most of the states. Modifying further the ideas of the framers of the Constitution, nearly all the states by 1828 chose their presidential electors directly rather than by the legislatures, and in 1832 the party nominating system for presidential candidates was instituted.

The most undemocratic American institution of the 19th century was that of Negro slavery, which was fatally entangled in economic, social, and sectional conflicts that finally led to the Civil War. It was not until after the Civil War had been launched that Abraham Lincoln and his party made Negro emancipation a part of their program. By the 13th, 14th, and 15th amendments, at the close of the war, slavery was abolished, and formal political rights were extended to Negroes. Severe political, social, and economic restriction on Negroes in the South, Northern indifference, and conservative judicial interpretation served, nevertheless, to prevent the complete emancipation of the Negro. In the 20th century, action by the Supreme Court and by Southern states gradually has given Negroes the substance of political rights and increased economic opportunity. "White primaries" were invalidated by the court in 1944, and by 1953 only five states still imposed poll taxes designed to hinder exercise of the suffrage. The Supreme Court decision of May 17, 1954, against racial segregation in public schools marked another advance toward granting Negroes the full benefits of democracy.

Other democratic reforms were sponsored by Populists and Progressives in the late 19th and early 20th centuries. By 1900 the secret Australian ballot was the rule among the states, and in 1913, the 17th Amendment, providing for direct popular election of senators, was ratified. The vote for women was secured nationally by the 19th Amendment in 1920. Emphasis on direct popular control was a feature of the Progressive movement, which sought to check the influence of the political bosses and the special interests by the devices of the initiative, the referendum, and the recall. Although in widespread use among the states, these techniques have by no means eliminated the evils they were designed to erase.

Education for citizenship was first voiced as a democratic ideal by Thomas Jefferson, planner and architect of the University of Virginia. Public education in America had first been sponsored in New England, under Puritan influence in the 17th century. Through the efforts of later reformers, like Horace Mann in Massachusetts, Henry Barnard in Connecticut, and De Witt Clinton in New York, the free, compulsory public school movement was securely established



and expanded. Although Massachusetts had a high school in 1821, the institution did not become an extensive national phenomenon until after the Civil War. By 1900 most of the states, after bitter dispute, had generally prohibited the use of public funds for sectarian purposes and forbidden sectarian instruction in public schools. Congress by law in 1876 required all new states to guarantee religious freedom and establish public schools free from sectarian control. The principle of separation between church and state, as applied to education, became contested, following the New Deal, by the question of the place of parochial schools in the program of federal aid to education and by the practice of granting released time from public schooling for private religious education.

American civil liberties were significantly extended by a Supreme Court decision (*Gillow v. New York*) in 1925 incorporating the liberties of the 1st Amendment into that "liberty" of the 14th Amendment which the states are forbidden to deny without "due process of law." In its interpretation of the latter amendment with regard to state regulation of economic activity the court had previously been extremely reluctant, despite vigorous dissents, to uphold legislation designed to correct the inequities and hardships of industrialism. From 1880 to 1930 the courts, for example, typically supported employers' "yellow-dog contracts," prohibiting employee labor union membership, and also enforced injunctions against striking, picketing, and boycotting by workers. The worker's right to freedom of economic association through the union was finally protected by the Norris-La Guardia Anti-Injunction Act of 1932 and the Wagner-Connery Act of 1935. During the New Deal the Supreme Court was faced with legislation, regulating national economic life, which it had traditionally rejected on the basis of laissez-faire dogmas about freedom of contract and the rights of property. The court largely abandoned this tradition, however, when it sustained the Agricultural Adjustment and Fair Labor Standard acts of 1938. Since then the court has stressed "due process of law" as a protection for persons rather than for corporations.

The rise of totalitarian parties and the challenge of two world wars put a great strain on liberal democracy in America. This stress was aggravated not only by the threat of internal subversion from antidemocratic organizations but also by the undemocratic methods of those politicians who claimed to defend national security by the imposition of a narrow party orthodoxy on opinion and association. The loosely constructed, decentralized party system and the frequent hostility between legislature and executive under the separation of powers principle make the modern crises of American democracy very severe, putting a high premium on responsible, courageous, popular leadership.

Rise of Democracy in England.—English political history has been qualified by the ancient traditions of monarchy and aristocracy, yet England has also been a land "Where Freedom slowly broadens down. From precedent to precedent." Although Parliament was long dominated by the landowning gentry, agitation for democratization of Parliament (foreshadowed by the Levelers in mid-17th century) began with the writings of the "Philosophic Radicals" in the *Westminster Review*, established in 1823. Under the intellectual leadership of Jeremy Bentham, James Mill, and John Stuart Mill, the Radicals envi-

sioned democracy as an instrument of good government and of domination by the middle class. But their utilitarian considerations limited their conception of democracy. It was not until John Stuart Mill's *Representative Government* (1861) that their case was made for democracy as something more than a mere technique of efficient management. "Evil for evil," wrote Mill, "a good despotism, in a country at all advanced in civilization, is more noxious than a bad one; for it is far more relaxing and enervating to the thoughts, feelings, and energies of the people." Nevertheless, despite the limitations of Benthamite utilitarianism, its political program called for wider representation in Parliament, annual elections, the secret ballot on a nearly universal scale, freedom of the press, and disestablishment.

Aided largely by the interest of manufacturers in breaking the monopoly of political power by landowners, the Radicals achieved some of their aims in the Reform Bill of 1832, which abolished "rotten boroughs," gave representation to the industrial towns, and widened the suffrage, although much of the lower middle class and all of the urban working class and farm laborers were still excluded from voting. Reform continued in the following year with the first step in the abolition of slavery throughout the empire: a program of gradual and compensated emancipation.

The ideas of the Philosophic Radicals also found expression in Chartism (q.v.) (1838–1848), basically a movement of protest among the working-class groups, neglected by the Radicals, against their exclusion from political power. In 1838 the leaders drew up a "People's Charter" demanding the abolition of property qualifications for suffrage and for membership in Parliament, the payment of members of Parliament, annual elections by secret ballot, and reapportionment of seats to equalize electoral districts. The Chartists tended to conceive of these democratic reforms as means toward the economic end of bettering the condition of their own class; yet, apart from factory legislation to protect health and safety, they had no coherent social or economic program. Like the programs of many reform groups, unsuccessful in their day, the political program of the Chartists was, however, realized by later generations. Even though Chartism failed in 1848, ten years later property qualifications for members of Parliament were removed.

Uninhibited by the dogmas of laissez-faire espoused by the utilitarian Radicals, socially minded Tories, led by Lord Shaftesbury, became advocates of legislation designed to protect workers against the evils of the factory system. In 1847 the Ten Hours Law, reducing the workday for women and children, and, in practical effect, for men also, was passed with the help of the Tories and against the opposition of the Benthamite Radicals. Under the reform leadership of Benjamin Disraeli the Conservative Party outbid the Liberal Party for extension of the suffrage so that the reform bills of 1867 and 1884 extended the vote to the working class. With the securing of the secret ballot in 1872, and payment for members of Parliament in 1911, universal suffrage by 1928, the Chartists' demands were belatedly answered.

Throughout the 19th century, following the lead of Edmund Burke, England developed its party system and cabinet form of parliamentary government, which became a model for the states of the British Commonwealth. Through the

Parliament Act of 1911 the power of the hereditary House of Lords was reduced to a mere delaying function. Within the context of a monarchy and an aristocracy, revered as political and cultural symbols of continuity, England became a democracy. After World War II, England, economically hard-pressed, experimented with socialism without abandoning her democratic government. By her celebrated talent for political tact, adaptability, and moderation England thus held feudal traditions, democratic politics, and socialist economics in stable solution.

Rise of Democracy in the British Commonwealth.—Canada, Australia, and New Zealand, lacking the serious racial problems of certain other British colonies and having no traditional hereditary aristocracies, were able to make democratic use of parliamentary government by a relatively quick and quiet process of development.

Canada's basic constitution, enacted as a statute of the British Parliament in 1867, established a federal system of a central Dominion and nine provincial legislatures. Although the British Parliament may amend the Canadian Constitution, the Dominion Parliament has had practical autonomy since the Statute of Westminster in 1931. The power of the crown, represented by an appointed governor general, is largely nominal; actual power belongs to the Canadian cabinet, supported by a majority in the Dominion House of Commons. The ministry, in practice, nominates the life-term senators, as well as the judiciary, while since 1920 the House of Commons has been elected by adult suffrage. In the provinces (now 10) all the legislatures except Quebec are unicameral, with provincial executives appointed by the Dominion executive.

Canadian federalism, with many fewer elective offices and Dominion control of executive and judicial power, is much more centralized, in theory, than United States federalism; yet by judicial interpretation in practice Canadian localism has developed firm roots. As in the United States, traditional local interests are often in conflict with the national powers demanded to solve modern economic problems, and Canadian federalism, like that of the United States, also promotes a two-party system which, despite the labels (Liberal and Conservative), functions through compromise and loose, shifting group alliances. By its federalism and its party system, Canada, again like her southern neighbor, is thus able to hold in balance its complex tensions, arising out of sectional, economic, ethnic, and religious differences.

Australia, which, in the judgment of Lord Bryce, has "traveled farthest and fastest along the road which leads to the unlimited rule of the multitude," developed local, state parliaments from 1855 to 1890. After two constitutional conventions a charter of government was adopted by popular vote and finally passed by the British Parliament in 1900. Both houses of the federal legislature are popularly elected, as are the lower houses in the states. The modern method of voting, the secret ballot, derives from its pioneer use in 1856 in Victoria.

English government also served as a starting point for New Zealand. By 1891 the lower house had become elective and dominant, the vote being granted to all adults in 1893. New Zealand pioneered in the extensive development, within a democracy, of public works, national

regulation of economic life, and compulsory arbitration of labor disputes.

Rise of Democracy in France.—Influenced by American republicanism, but not its federalism, France turned through the revolution of 1789 toward democracy. Yet the harshness of centralized absolutism, formerly monarchical, reappeared in the new guise of democratic despotism when the French Revolution (q.v.) culminated in the Reign of Terror (q.v.) and, finally, in Napoleonic dictatorship. This ambiguity of France's democratic revolution illustrates the hazards of establishing liberal democracy in a society fundamentally feudal without long preparation. Since 1789 Frenchmen have lived under a great many different constitutions and have experimented more than once with republicanism, monarchism, and dictatorship. Yet the democratic idealism enshrined in the Declaration of the Rights of Man and the Citizen, promulgated on Aug. 27, 1789, has remained a continuing source of inspiration for democratic movements in France and Europe in general. This charter, marking a significant break with feudalism, proclaimed "the natural and imprescriptible rights of man" to "liberty, property, security, and resistance to oppression," and it affirmed freedom of opinion, equality before the law in political rights, separation of legislative and executive powers in the government, and popular sovereignty in the nation.

Individualistic in spirit, the middle-class idealism of the early revolutionaries was soon transformed when the moderate leadership of the comte de Mirabeau and Abbé Sieyès, in the period of limited constitutional monarchy (1791–1792), gave way to that of Jean Paul Marat, Georges Jacques Danton, and Maximilien de Robespierre. At first inspired only to broaden the popular base of the new government, the revolutionaries, responding to the threats of internal division and foreign invasion, gradually consolidated their power into the Committee of Public Safety which established Robespierre through the bloody Reign of Terror as virtual dictator of France. The democratic constitution of 1793, drafted by the National Convention, thus never went into effect, although the main social and economic privileges of the feudal regime had been swept away. In the minds of men like Robespierre, Louis Antoine Léon de Saint-Just, and François Noel Babeuf the despotic implications of Rousseau's General Will became clear. As J. L. Talmon has shown (in *Rise of Totalitarian Democracy*), democracy then became identified with the dictatorship of an "enlightened" vanguard, speaking for the alleged interests of a fictitious, unanimous popular will. All divisions of opinion were suppressed, and the minority became the absolute enemy of the majority. After Robespierre's death and the failure of the republican government of the Directory, the victorious general, Napoleon Bonaparte, seized power by a coup d'état on Nov. 9, 1799.

Following two post-Revolutionary experiments in constitutional monarchy, France, inspired by the spirit of 1789, established the Second Republic in 1848. Yet by a familiar process this democratic government, with a Legislative Assembly elected by adult, male suffrage and with a popularly elected president, was transformed into the dictatorship of Louis Napoleon (Napoleon III), whose lip service to democracy was attested by his fondness for plebiscites. Not until the policies of Louis Adolphe Thiers and

Léon Gambetta were realized in the erection of the Third Republic did democracy revive in France. A new constitution, established by a series of fundamental laws passed between 1871 and 1875, provided for a peculiar blend of the presidential and cabinet systems of government. The president soon, however, became a figure-head, and the cabinet was rendered subservient to the legislature, which became the fountainhead of all power, but which was weakened by the number of conflicting minority parties formed on narrow bases of interest and doctrine. Despite these weaknesses, however, the Third Republic fostered the democratization of the Senate and of municipal government, the disestablishment of the church, the creation of a network of free, compulsory public primary schools, the granting of the secret ballot, and the legal support of collective bargaining between labor and management. The Third Republic officially ended on July 10, 1940 when France was crushed by the overwhelming might of invading German armies.

But the republican and democratic tradition survived, to be revitalized when Great Britain and the United States, in October 1944, recognized General Charles de Gaulle's Provisional Government of the French Republic. The constitution of the Fourth Republic, approved Oct. 13, 1946, set up a National Assembly on the basis of adult suffrage and an indirectly elected, but very subordinate, upper chamber. But again there were no effective checks and balances in the combined presidential and cabinet systems, and French parties became as splintered as before. The new constitution, in contrast to the basic political emphasis of the original Declaration of the Rights of Man, stressed the group economic rights of workers, the need for governmental control of monopolies, and the importance of welfare services for children, mothers, and the aged. Since the French revolution, France has had a radical socialist tradition which has flowed, sometimes in conflicting currents, along with the democratic stream. The fate of the Fourth Republic depends to a large degree on whether or not France can find a historical reconciliation of democratic freedom with effective governmental authority and of liberalism with socialism.

Rise of Democracy in Western Europe.—Democracy, combined with federalism, found its earliest and most secure foothold in Europe with the Swiss constitutions of 1848 and 1874, although local self-government had existed in Switzerland on a provincial scale even before the Treaty of Westphalia recognized the independence of the confederation in 1648. Direct democracy is extensively practised in the mass town meetings of the municipal communes, in the assemblies of some of the 25 cantons, and in the use of the initiative, the referendum, and the recall on both a local and national basis. The Swiss Federal Assembly is organized much like the Congress of the United States, with two chambers, the Council of States and the National Council. The executive authority is lodged in the 7-member Federal Council elected by the Federal Assembly. Unlike the American Supreme Court, the Swiss Federal Tribunal is appointed by the Federal Assembly for short terms, and has no judicial review over national laws. Because of the steadiness of the Swiss character and the traditional isolation of the small country, democracy in Switzerland has had a uniquely untroubled career.

In the rest of western Europe democracy has slowly developed out of constitutional monarchies whose history has been that of the gradual growth in power of an increasingly popularly elected lower house, the eventual limitation or democratization of the upper house, and the steady reduction of kingly prerogative to ceremonial formalities. This process has characterized the histories of Belgium, the Netherlands, Denmark, Norway, and Sweden, all of which countries had become parliamentary democracies based on adult suffrage by 1920. The harsh experience of two world wars and their aftermaths left these states still securely in possession of their democratic institutions.

Elsewhere in Europe, where democracy was introduced only in the 20th century, democratic forces were eventually supplanted by totalitarianism of the left or right. Italy, though plagued with illiteracy and conflicts between church and state, had reared parliamentary government on nearly complete adult male suffrage by 1912 before it succumbed 10 years later to fascism (q.v.). Almost as short-lived was Germany's Weimar Republic after World War I which collapsed with the rise of Nazi dictatorship in 1933. These totalitarian powers, joined with Japan, posed a terrible threat to the democracies in World War II. Since the war and by 1950 parliamentary institutions were planted in the young republics of the defeated powers of Italy and Germany, as well as in those of Ireland, Israel, and Turkey.

Rise of Democracy in Eastern Europe.—After World War I the constitutions of the republics of Latvia, Lithuania, Estonia, Czechoslovakia, Poland, and Finland provided for adult suffrage, secret ballot, religious liberty, and cabinet government. Democracy seemed to be in the ascendance all over Europe, its future certain and triumphant.

Russia, after the revolution of 1917, sweeping away the Czarist regime, had made peace with Poland and recognized the independence of the Baltic republics. Her own character, after the downfall of the Kerensky parliamentary government and the triumph of the Bolshevik (q.v.) movement in November 1917, was a controversial question in the rest of Europe. Actually, Marxist democracy was much like the totalitarian democracy that had appeared during the French Revolution. Nikolai Lenin, in his *The State and Revolution* (1917, Eng. tr. 1919), made it clear that for Communists parliamentary democracy was only a "talking shop" and a vested interest of the privileged. He defined "true" democracy, as Robespierre had done, as a state "which recognizes the subjection of the minority to the majority, that is, an organization for the systematic use of *violence* by one class against the other, by one part of the population against another." From this point of view the dictatorship of the proletariat, the period of transition to communism (q.v.), would, "for the first time, produce a democracy for the people, for the majority, side by side with the necessary suppression of the minority constituted by the exploiters."

Nothing could be more hostile to the point of view of liberal democracy than this kind of "democracy." Thus in Soviet Russia democracy means elections, representation, and mass participation in local political and economic administration; but, despite the emphasis on the sover-

eighty of the popular will, government is the prerogative of one party. Political or cultural dissent is ruthlessly suppressed, and Soviet civil liberty means only the guaranteeing of material access to assembly halls and presses, not the spiritual rights of free expression.

Under Joseph Stalin, Soviet Russia, through the advances of the Red Army during and after World War II, took control of the Baltic republics, Poland, and Czechoslovakia. The lights of liberal democracy in eastern Europe were extinguished, while in the rest of Europe the chances for its survival depended on the collective security of free societies everywhere.

See also CONSTITUTION; ELECTIONS; FEDERAL GOVERNMENT: GOVERNMENT; REPRESENTATIVE GOVERNMENT; REPUBLICS, THE HISTORY OF; SOCIAL REFORM PROGRAMS AND MOVEMENTS; SOCIAL REFORM PROGRAMS SINCE THE FIRST WORLD WAR; TOWN AND TOWN MEETINGS; WOMAN SUFFRAGE; also history and government sections of articles on the various countries.

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CUSHING STROUT,

Department of History, Yale College.

DEMOCRACY: An American Novel, by Henry Adams (q.v.), published anonymously in 1880. Madeleine Lee, a rich New York widow, moves to Washington with her sister Sybil, am-

bitious to attain power in governing circles. Her admirer, lawyer John Carrington, introduces her to the political boss Senator Ratcliffe whose party has just elected the new president, "Old Granite" (Hayes?). The latter, while hating and distrusting Ratcliffe, is yet forced to promise him the treasury secretaryship. Madeleine is about to accept the senator's suit when she learns he is a typical corrupt politician and rejects him.

DEMOCRACY AND EDUCATION, An Introduction to the Philosophy of Education, by John Dewey (q.v.) published in 1916.

The book is an inquiry into the nature of democratic society and a discussion of the kind of public education suited to such a society. The first six chapters are devoted to the nature of education in general, followed by a statement of the democratic concept in education and an extended development of consonant objectives and procedures. The two final chapters present a critical examination of what the author regards as outmoded theories of knowledge and of right and wrong, theories which linger on as harmful anachronisms in societies presumed to be democratic. From the outset, the importance to democracy and to education of scientific method, the evolutionary hypothesis, and the industrial revolution, is assumed.

As the work of one of America's foremost philosophers, particularly in the educational field, *Democracy and Education* reflects John Dewey's well known liberalism and his pragmatic approach to truth. The argument is systematically conducted, each chapter being furnished with a descriptive title and a final summary, and the language is not unduly technical. The title is but one of a number from the same pen which have strongly influenced educational theory and practice in the United States over a period of nearly half a century.

MARK HARRIS.

DEMOCRACY IN AMERICA (*De la Démocratie en Amérique*) by Alexis de Tocqueville. It was in 1831 that a minor civil servant, Alexis de Tocqueville, was sent by the French government to the United States to report on prison conditions in that country. This investigation, though duly made, was but an excuse; the real purpose of young Tocqueville's visit was to study the nature and operations of American democracy. To fulfill this purpose Tocqueville spent some 18 months in the United States, traveling up and down the Atlantic seaboard, west as far as Michigan, and south to Louisiana, talking with most of the leading figures in American public life, reading widely in the literature of politics, government, and law, and generally keeping his eyes open and his mind receptive. Shortly after his return to France he began work on the book which was to win him worldwide fame. The first two volumes of *De la Démocratie en Amérique* appeared in 1835, the second two in 1840. The book was recognized at once as the most perspicacious and profound analysis of American institutions that had yet appeared, and a century later there was still no reason to qualify this judgment.

"I confess," wrote Tocqueville, "that in America I saw more than America; I sought the image of democracy itself, with its inclinations, its character, its prejudices, and its passions, in order to learn what we have to fear or to hope from its progress." This gives the clue to the book. It was not written primarily as a description of America, a commentary or a criticism, as were the contemporary works by Trollope, Martineau, Marryat, Dickens, and others. Its purpose was "to learn what we have to fear or to hope." America, in short, was not the primary object of Tocqueville's

investigation, but rather, democracy—a word which Tocqueville used much as we use it today to embrace social and economic as well as political practices and institutions. For democracy, Tocqueville was persuaded, was inevitable and irresistible, its doctrines and practices bound to spread over the western world. "The question here discussed," he wrote, "is interesting not only to the United States but to the whole world; it concerns not a nation but all mankind."

If democracy was inevitable, would not mere description suffice? No, for democracy, as Tocqueville saw it, was no simple thing, but complex and various, manifesting itself in different ways, taking on the color of its environment, responding to the character of those who practiced it. It was possible, so Tocqueville thought, to distinguish the good from the evil in democracy, the temporary from the permanent, the particular from the universal. He was convinced, therefore, that by analyzing the working of the spirit of democracy in America he could instruct his own people about their policy, warn them against avoidable evils, prepare them for unavoidable developments. Democracy was inevitable but the form which it would take was a matter over which men might exercise some control. Tocqueville was one of the first students of politics to recognize the truth, so often ignored even in our own day, that the great forces of history do not operate uniformly in all societies, but are naturalized, as it were, wherever they appear.

Tocqueville, therefore, looked upon America as a great laboratory, a proving ground for the operation of democracy. It is this point of view that distinguishes *Democracy in America* from almost every work written by foreigners about the United States. It was the first philosophical study of democracy, and of America, that had appeared, and it is still the best.

A spirit of philosophical inquiry permeates the whole book, but particularly the second set of volumes. For brushing aside everything merely trivial, ephemeral, or sensational, Tocqueville directed his acute intelligence towards an understanding of what he thought fundamental and permanent. What was fundamental was, he saw, the doctrine of equality, and it is with the pervasive influence of this doctrine that his inquiry is largely concerned. For, as he observed in the preface of the first volume, "nothing struck me more forcibly than the general equality of conditions. I readily discovered the prodigious influence which this primary fact exercises on the whole course of society. . . . I speedily perceived that the influence of this fact extends far beyond the political character and laws of the country, and that it has no less empire over civil society than over the government; it creates opinions, engenders sentiments, suggests the ordinary practices of life, and modifies whatever it does not produce. The more I advanced in the study of American society, the more I perceived that the equality of conditions is the fundamental fact from which all others seem to be derived, and the central point at which all my observations constantly terminated."

Here Tocqueville disclosed his instinct for the jugular vein, and once he had fastened upon it, he held it with pertinacity. From the point of view of equality he proceeded to examine every institution, every manifestation of American life. The first volumes dealt largely with the influences of this doctrine in the realm of politics and law—and it was here that Tocqueville propounded that theory of the tyranny of the majority which dazzled contemporary opponents of democracy and has given comfort to their successors ever since. But Tocqueville qualified his theory of majority tyranny with the observation, often overlooked, that democracy makes for conservatism, and that the surest guarantee of stability is the wide distribution of property.

The second set of volumes was more philosophical—and perhaps more abstract—than the first; already the sharp impression of personal experience was wearing off, the pressure of France was growing stronger, and Tocqueville resorted more and more to speculation and rationalization. Yet here are the famous chapters—many of them astonishingly prophetic—on the influence of equality on philosophy, religion, science, the arts, language and literature, business, the family, manners, war, and the military.

The peculiar merit of these chapters is their rigorous analysis, an analysis often based on a priori reasoning, yet grounded upon such careful observation and pressed with such implacable logic that they proved for the most part sound. Thus Tocqueville reasoned that though our literature was, at that time, colonial, it would become in time independent; that it would concern itself with the interests of the plain people rather than with the upper classes; and that it would eventually perfect its own idiom. He saw that democracy must have its own history, one in which the individual was subordinate to the mass, and fortuity, to great sweeping movements. He penetrated to the gnawing uncertainty of many Americans about social democracy, the pretentiousness

and insincerity of much of the talk about the common man by men who took for granted that they were uncommon men. He understood the combination of extravagance of language and prudence of conduct. He noted the American zeal for change and connected it with the restless search for the ideal and the opportunities offered so generously to achieve that ideal. He saw the significance of the interaction of democracy and religion, and anticipated that denominational efflorescence so characteristic of American life. He discerned the natural hostility to the military in a democracy, but foresaw with remarkable accuracy the effect of prolonged war on American society, economy and philosophy. He appreciated the necessary connection between democracy and the emancipation of women and the logical consequences of democracy in altering the relationships of parents to their children. He was the first foreigner to comprehend the significance of the dominance of the American political scene by men trained to the law, and described, in terms still relevant, the aristocracy of the robe.

Democracy in America is not without its defects—defects so numerous and profound that in most other books they would be fatal. Tocqueville was inclined to substitute his own reflections for facts, and his interpretation was often top-heavy. He did not sufficiently check what he thought was bound to happen with what was actually happening, and where history ran counter to his predictions, he was inclined to blame history. Thus he speculated on the tyranny of the majority without citing any examples of that tyranny; insisted upon the inherent weakness of the executive power at a time when Andrew Jackson was in the White House; exaggerated, like many lesser observers, the importance of manners, and was capable of writing of democracy that "many men would willingly endure its vices who cannot support its manners." He was not familiar with the English background of American institutions, and frequently mistook for a peculiarly American phenomenon what was really Anglo-American. He knew the East better than the South and West, consulted overmuch with the rich and the wise and the wellborn and permitted his views to be colored by those of men whose fears outran their hopes. He almost entirely ignored important economic developments, missed most of the reform movement—abolition, woman's rights education—and failed signally to appreciate the substantial American contributions to literature and the arts.

Yet the positive merits of the book are so great as to dwarf these demerits. What are those merits? Tocqueville chose a great and spacious theme, and handled it with lofty dignity. He saw the real significance of America in history and concentrated upon that significance to the exclusion of lesser irrelevant matters. His interpretation was unfailingly judicious; even where critical, his criticism was impersonal; his view of democracy was often pessimistic but never jaundiced. Although his work was instructive and even didactic, he was a genuine student, and his didacticism was directed to his own countrymen, not to Americans. No other critic, not even Bryce or Münsterberg or Brogan, has achieved the loftiness, the objectivity, the serene impartiality, that Tocqueville revealed. And, finally, it is a signal merit of the book that the style, even in translation, is unfailingly felicitous and at times brilliant.

There are two standard translations of *Democracy in America*—one by the Englishman, Henry Reeve, and one by the American, Charles Bowen. The first is perhaps the more literary, the second the more faithful; neither is entirely adequate. The best edition of the work is that by Phillips Bradley, and the most thorough history of the writing of the book, George Pierson's *Tocqueville and Beaumont in America* (1938).

HENRY STEELE COMMAGER,

Department of History, Columbia University.

DEMOCRATIC PARTY. The, grew out of the political philosophy of Thomas Jefferson and his struggle in the first decade of national history to make the United States a democratic republic. His position in the Virginia legislature, in the first stages of the fight for independence, was based on his insistence on the right of peoples to determine their own destiny, emphasized in his famous pamphlet *A Summary View of the Rights of British America*, and in the preamble of his *Declaration of Independence*. Immediately following the Declaration, he launched his historic fight in the Virginia legislature to wipe out the remnants of feudalism through the ending of such pillars of aristocracy

as the laws of primogeniture and entail, followed by the separation of church and state, the ordinance of religious freedom, and the establishment of a system of popular education.

Pleased with the provisions in the Constitution making for a strong and stable government, Jefferson was shocked by its failure to include a bill of rights for the protection of the people against the abuse of power. He had learned that the prevailing sentiment in the Constitutional Convention had been to stem the democratic trend, and he led the fight for a bill of rights with the assertion that a bill of rights was what any people were entitled to and which no government could refuse or permit to rest on inference. The right of the people to rule, equality before the law, the liberty of the press, freedom of speech, the right to petition for the redress of grievances, and the separation of church and state with freedom of religion, entered into his concept of a good society and became the pillars of his party. This led to the introduction of the Bill of Rights in the first days of the first session of the Congress.

On his return to America from Paris to head the Cabinet of Washington, Jefferson was amazed to find a powerful phalanx, with predominant influence in the determination of policies, under the brilliant leadership of Alexander Hamilton, who frankly despised democracy, who scorned the people and was convinced that a stable government could not be assured without a close partnership between the propertied, commercial, and financial groups and the government. Hamilton's partisan biographer, Henry Cabot Lodge, wrote that he planned "to array property on the side of government" and "to assure to the property of the country a powerful influence upon the government"; that "having been unable to introduce class influence into the Constitution by limiting suffrage with a property qualification," he sought to accomplish the same end in another way.

Federalists, The.—Hamilton's party was recruited from the old Tory element which had opposed the Revolution; the wealthy American merchants concerned primarily with profit; the speculators and holders of public funds in the banks; the office holders willing to sacrifice principle to personal prestige and place; and those of the middle class intimidated by the masses. This party, unable to write its ideology into the Constitution, was seeking through a loose interpretation to achieve its ends, and in this it was abetted by the fact that a large part of the federal bench was composed of the party's militant supporters.

At first a disapproving observer, Jefferson was soon forced to action by Hamilton's financial policies and plans. The latter's plan for the funding of the debt played unintentionally, perhaps, into the hands of the speculators who have never been more active and arrogant than during the first days of the republic. Revolutionary scrip in the hands of soldiers and minor merchants had sunk to zero in value, and the speculators, with foreknowledge of the intent to redeem the scrip at face value, took advantage of the ignorance of the masses as to the plan and bought it up for a few cents on the dollar. Jefferson's lieutenant, James Madison, proposed an amendment to the funding bill providing full payment to the original holders, but for the redemption of the scrip in the hands of the speculators at the price paid at the time of the purchase. Wall Street rushed to

the defense of the Hamilton bill, flooded the corridors of Congress with lobbyists, and the Madison amendment failed. Later it was found that of the 64 votes for the original bill, 29 were cast by speculators in scrip.

Hamilton's bill for the creation of a national bank (a vital part of his system) followed immediately. The Jeffersonians opposed it as unconstitutional and monopolistic in its possibilities. Hamilton evoked the doctrine of "implied powers" but the Jeffersonians insisted on the strict construction of the Constitution. Fisher Ames, a leading lieutenant of Hamilton's, in a personal letter to Dr. Timothy Dwight wrote at the time that "no man would pretend to give Congress the power under a fair construction of the Constitution." The Federalist majority passed the bank bill, and after some hesitation Washington signed it (Feb. 25, 1791). He was bitterly attacked by the speculators and Wall Street during the period of his hesitation.

It was out of these general conditions that Jefferson discussed with Madison the organization of a party of opposition dedicated to the full realization of democracy and a strict construction of the Constitution. From this beginning until the final victory of 1800, the Democratic Party (at first called the Republican Party) fought for strict construction and equality before the law; against privilege and monopolistic tendencies in legislation; and for the realization of Jefferson's concept of democracy.

One of the most acrimonious struggles of this period grew out of the French Revolution. The Federalists looked with hate on the movement to destroy the old feudalistic system of Europe; the Democrats were in complete sympathy with the object of the revolutionists. In this they were embarrassed by the stupidities and indiscretions of Edmond Charles Edouard Genet, the French minister to the United States, and by the Terror with its atrocities. The Federalists made the most of the crimes and excesses; the disapproving Democrats saw through them to the ultimate, democratic intent.

The climax of the Federalist ineptitude came with the passage of the Alien and Sedition law (1798) which set aside the Bill of Rights and attempted, through a terrorism of its own, to destroy the liberty of the press, the freedom of speech, and the right to assemble to petition for the redress of grievances. Democratic editors were arrested and cast into jail on the slightest pretexts; federal judges delivered demagogic harangues from the bench, packed the juries, and gave perfect imitations of the methods of the infamous Baron George Jeffreys. This aroused the mass of the people. A stout resistance was offered, and the Democratic Party at the time became the custodian and defender of liberty and the rights of man. In the election of 1800, the Democrats won and Jefferson became president. This victory, according to Henry Cabot Lodge in his biography of Hamilton, "definitively determined that ours should be a democratic republic."

Democratic Principles.—Jefferson's inaugural address is often cited as setting forth the elemental principles of the Democratic Party. In enumerating the "essential principles of government" on which he would administer, he included the following:

"Equal and exact justice to all men, of whatever state or persuasion, religious or political.



"Peace, commerce, and honest friendship with all nations, entangling alliances with none."

"The support of the state governments in all their rights, as the most competent administrations for our domestic concerns, and the surest bulwarks against anti-republican tendencies."

"The preservation of the general government in its whole constitutional vigor."

"A jealous care of the right of election by the people . . . absolute acquiescence in the decisions of the majority."

"The supremacy of the civil over the military authority; economy in the public expense . . . ; the honest payment of our debts, and sacred preservation of the public faith; encouragement of agriculture, and of commerce, as its handmaid; the diffusion of information, and arraignment of all abuses at the bar of the public reason; freedom of religion; freedom of the press; and freedom of person, under the protection of the *habeas corpus*; and trial by juries impartially selected."

Jefferson's Administration.—These eight years marked the consolidation of the triumph and put the country positively on the democratic track. Economy was enforced and the country prospered; the liquidation of the national debt began with considerable success; and unnecessary internal taxes were repealed. Under the direction of Albert Gallatin, one of the greatest of all the secretaries of the treasury (1801-1814), radical reforms were made in the treasury system set up by Hamilton. Gallatin demanded specific appropriations to the end that money appropriated for this or that object could not be diverted to other ends. Prominent on the reform program of Jefferson was the federal judiciary which had become notorious during the period of the Alien and Sedition laws when judges habitually delivered threatening political harangues from the bench and, in political cases, packed the juries for conviction. This program, too, met with the bitter opposition of the Federalists, but the reform was wrought and the judiciary took on the dignity and decorum it has since maintained. The Judiciary Act (1789), with which the Federalists in defeat sought to perpetuate their power despite their repudiation at the polls, was repealed. In the debate of unprecedented bitterness, secession was threatened by the Federalist Party. Hamilton's plan to stem the democratic tide failed.

When the empire of Louisiana was peacefully acquired through purchase (April 30, 1803) at a ridiculously low price, it met with Federalist opposition on the ground that it was "unconstitutional" and the price too high, and again the specter of secession was raised.

The second Jefferson administration brought an acrimonious controversy with Great Britain because of the impressment of American seamen and the violation of American rights upon the sea. Unable to secure satisfaction through diplomatic negotiations, Jefferson sought a substitute for war in the Embargo Act (1807) which again aroused the ire of the Federalists. They inspired violations of the law, encouraged lawlessness amounting to treason, and the more extreme openly championed Britain against the United States. At one time the losses to Britain reached such an alarming stage that the embargo might have served its purpose but for violation of the law by commercial interests in the United States. The Federalist attitude at this time led straight to the Hartford Convention. The Jefferson administrations had clearly drawn the distinction between the two schools of political thought. His party stood for a strict construction of the Constitution; the Federalists, for the doctrine of implied powers. His party favored local self-government; the Federalist, the greatest possible concentration of power. His party de-

manded equal rights and proscribed monopolies; the Federalists followed their policy of special privilege to the rich. His party was the sponsor and custodian of the democratic concept of the state; the Federalists favored the rule of the aristocracy and the wealthy. But before the termination of the second administration the republic was permanently assured, and democracy was definitively established as to its form.

Monroe Doctrine, The.—During the succeeding years the government was in the possession of the Democrats under the presidency of Jefferson's two chief lieutenants, Madison and Monroe. They consulted with Jefferson on all major issues. The failure of the embargo led to the War of 1812, conducted by the Madison administration, and it was on the issue of the war that the Federalists were to destroy their party. The climax of disloyalty came in the Hartford Convention (1814) which called upon the legislatures of the various states to nullify the war measures of the national government. In the presidential election of 1812, the Federalists had gone into the Democratic Party for a candidate whose ambition overshadowed his principles, and De Witt Clinton ran as the avowed choice of the more selfish commercial interests who had fought the Embargo Act and would oppose the war. Despite the initial difficulties of the war, the spectacular triumph of Commodore Oliver Hazard Perry and the victory of Andrew Jackson at New Orleans (1815) reflected honor on the administration.

In the election of 1816, James Monroe succeeded to the presidency and the leadership of the party. His democracy was militant and austere, and on fundamental principles he was uncompromising. The country prospered during his tenure. The Federalist Party, besmeared by the Hartford Convention, was in the last stages of disintegration, and Monroe's re-election in 1820 was all but unanimous. Known as the era of good feeling, the disappearance of the Federalist Party left the country without a well-defined party of opposition, and there was a danger that political struggles might degenerate into fights of factions intent on the advancement of ambitious individuals, but each faction at this time stoutly insisted on its adherence to Jeffersonian principles. The two major achievements of this Democratic administration were the acquisition of Florida and, most important of all, the enunciation of the Monroe Doctrine defining decisively the attitude of the United States toward South America, just emerging from the Spanish yoke. Sympathizing heartily with the revolting colonies, Monroe moved cautiously but surely toward their early recognition. He consulted Jefferson and Madison (in retirement) as to the wisdom of enunciating a declaration to the effect that the United States would permit no interference by any European country in the affairs of the American nations. Jefferson replied that the proposed message of Monroe "is the most momentous which has been offered to my contemplation since the Declaration of Independence." Madison replied in like tenor, and the president gave the Monroe Doctrine to history (1823). Thus, one of the greatest state papers in the annals of the nation was given the world as democratic America's answer to the Holy Alliance. It was in conformity with the elemental principles on which the party had been built.

Tariff Laws.—In 1824, John Quincy Adams was elected president by the House of Representatives. The presidential contest that year was personal rather than political. Adams had left the Federalists twenty years before to align himself with the party of Jefferson, though some questioned the extent of his conversion. He was a brilliant man of stalwart patriotism, but his personality lacked the color and magnetism to attract the masses, and throughout his administration the battle for the succession was in progress. Toward the end of his regime, Congress enacted (1828) a protective tariff law with rates so high that it is known to history as the Tariff of Abominations. During the greater part of his administration (with the Federalist Party practically extinct or under cover) there was a trend toward party readjustments and, among the masses, a general demand for the election of Andrew Jackson to the presidency in 1828. No one could have been found more devoted to the Jeffersonian principles of democracy than Jackson, though his direct and aggressive methods contrasted with the more subtle practices of the founder of the party.

During the eight years of Jackson's administration, political controversy reached white heat. Motivated by a morbid ambition for the presidency, Henry Clay maneuvered throughout the administration toward the creation of the Whig Party, to which a large part of the now defunct Federalist Party adhered. Though professedly, at first, an adherent of Jeffersonian principles, Clay set himself to the task of mobilizing under the banner of the new political party the property interests, the manufacturers, and the financiers who had inspired the policies of Hamilton.

He launched his fight on the tariff when the general indignation of the masses over the Tariff of Abominations necessitated the enactment of a new tariff act. Eager to maintain the protective features of the Tariff of Abominations and yet satisfy the people with a reduction in customs taxes, Clay conferred with the beneficiaries of protection and sponsored a bill which reduced the taxes by placing items on the free list, but he did not touch materially the protected items of the old tariff. This had a twofold purpose: (1) to maintain undisturbed the protective tariff; (2) to satisfy the people by a reduction of other customs taxes which would reduce the income of the Treasury, crippling Jackson's plan for the early liquidation of the national debt. This would reflect credit on the administration. The Democrats wished to strike out the special privileges of the industrialists, but the measure (considered a compromise) was passed (1833).

Banking.—Democratic hostility to the national bank reached the masses of the people because of its use of the control of credit, its monopolistic features, and its potentiality for political evil. Though the bank's charter had four years to run, Clay and the Whigs insisted that it apply at once for a recharter. Conscious of Jackson's irreconcilable opposition, Clay was inspired by purely political motives. He knew that, should Congress grant another charter, Jackson would veto the measure and throw the bank, with all its enormous resources, into the presidential campaign of 1832 in support of Clay's candidacy. Through retainers to members of Congress (including Daniel Webster), through the subsidization of the press, and through special privileges in the matter of credit, the bank had come to be a chal-

lenge to government itself. The recharter of the bill was passed as Clay had planned, and Jackson vetoed it as Clay had hoped. Jackson's veto message was a call to arms of the masses and of the traditional enemies of the bank. It was a challenge to the embryo plutocracy. "It is to be regretted," Jackson said, "that the rich and powerful too often bend the acts of government to their selfish purposes. Many of our rich have not been content with equal protection and equal benefits but have besought us to make them richer by acts of Congress." Nicholas Biddle of the bank denounced the message as "a manifesto of anarchy such as Marat or Robespierre might have issued to the mob." Again the people were the "mob" as in Federalist days, and again the Democratic leader was a Marat and Jacobin as in the time of Jefferson. The old Jeffersonian battle of years before was revived. Both the Democrats and the Whigs were pleased with the message: the former because it rallied the masses to the party, and the latter because it forced the great financial interests into the campaign for Clay. The campaign of 1832 was one of the most bitter in American history. Through the money of the bank, inroads were made upon the press through a form of bribery; the power over credit was used ruthlessly against the supporters of Jackson; and resort was had to the most open use of intimidation and coercion. Industrialists threatened to close their factories if Jackson was re-elected, but the masses rallied as never before since the days of the Alien and Sedition laws. Immense mass meetings thundered defiance to the money powers, and farmers deserted the fields to march in procession from one rally to another. The result was the overwhelming re-election of Jackson with 219 electoral votes to 49 for Clay. Embittered by defeat, Clay resumed his bank fight in Congress with increased virulence, and Jackson, after a struggle of great bitterness, removed the government deposits from the national bank to prevent their further use for political ends. Clay secured a vote of censure against Jackson for the act, and Jackson replied with a devastating philippic against the bank and its methods. To "discipline the people" the bank did everything possible to precipitate a panic. The recharter fight was lost, however, and after a long struggle, Congress expunged the vote of censure from the record. Thus the bank which Jefferson had opposed was finally destroyed.

Nullification Act, The.—Another important struggle of the Jackson regime was brought on by the attempt of South Carolina, under Calhoun's leadership, to nullify the acts of the national government. This grew out of a struggle in which both the tariff and the rapidly emerging slavery issues were prominent. Jackson, a Nationalist and Unionist, with his usual courage and decision, prepared for action, military if necessary. He crushed the nullification movement and destroyed the presidential prospects of Calhoun. The Jackson administrations strengthened and reaffirmed the democratic ideals promulgated by Jefferson, and Jackson retired as the idol of his party and of a large part of the nation.

Subtreasury Bill, The.—The Democratic nominee for president in 1836 was Martin Van Buren, the favorite of Jackson. He was a consummate politician, thoroughly indoctrinated with the Jeffersonian philosophy of government, and a statesman of ability and vast experience. Throughout his administration the country suf-

ferred a depression, ascribed by the Democrats to the actions of the bank and its supporters but by the Whigs to the failure to recharter the bank. Van Buren declared in the beginning that under no circumstances would he agree to rechartering that institution. Instead, the administration sponsored the Subtreasury Bill intended to divorce government from banks. It envisioned the government handling its own money. The Subtreasury Bill was passed (1840) by a strict party vote.

Whigs, The.—Encouraged by the depression, the Whigs sought a popular candidate for 1840 (not as intimately identified with controversial issues as Clay), and William Henry Harrison was named. Having spent most of his life on the frontier fighting the Indians, he was dubbed the "log cabin candidate" which made an appeal to the Western country. Wishing to take full advantage of the anti-Jackson element among the Democrats, the vice presidential nomination was offered to John Tyler. In accepting, Tyler made it crystal clear that his acceptance would not mean a deviation one hair's breadth from his fixed political principles. He was a Democrat thoroughly imbued with Jeffersonian principles. His reservation was accepted on the theory that, as vice president, it would make no difference. Harrison (who was elected) had scarcely taken his seat when he died, leaving another Democrat in the White House. Tyler had warmly supported Jackson in the Senate on the issue of rechartering the bank; he had broken with him on the removal of the deposits as an unconstitutional act of executive usurpation which formed a dangerous precedent, and he voted for the censure. When instructed by Virginia to vote to expunge, Tyler recognized Virginia's right of instruction and resigned as senator. He had always opposed the Whig program for a protective tariff.

Clay and the Whigs sought to align Tyler with them on the bank and the tariff. When the Subtreasury Act was repealed, Congress passed, under Clay's leadership, a law creating a fiscal bank with headquarters in Washington and with authority to establish branch banks throughout the country with the consent of the states affected. It was the old national bank of Hamilton with variations. Tyler vetoed the measure on the traditional ground of the Democrats that Congress had no constitutional right to establish a national bank. The Whigs turned upon him with fury, and mobs gathered at the White House shouting insults. This veto was followed by another when the Whigs passed a bill of the same sort, calling the bank the fiscal corporation rather than the fiscal bank. Tyler having demonstrated that he was a Democratic president, all the Whigs of the Cabinet except Daniel Webster resigned.

When Tyler was confronted with a protective tariff bill, he vetoed it, thus divorcing himself completely from the Whigs. In the field of foreign relations, however, Tyler's administration was eminently successful, and the Webster-Ashburton Treaty (1842) amicably ended a controversy which was becoming threatening.

Walker Tariff, The.—In the presidential election of 1844, the Whigs again rallied under the banner of Henry Clay, and the Democrats nominated James K. Polk. Partisan historians have insisted on the absurd story that he was utterly unknown to the nation and possessed little ability. He had been an effective floor leader of the Dem-

ocrats during the bank fight in the House of Representatives and had been speaker of the House and later, governor of Tennessee. He was not brilliant, but able, sound, energetic, and decisive. In four years he revised the tariff; reformed the financial system; settled the long-pending Oregon boundary dispute and that of the Maine boundary; settled the Texas question; successfully directed a war that added California and New Mexico to the Union; and voluntarily retired after one term. Few administrations show a record of such achievement crowded into so short a period. From the party viewpoint, the revision or reformation of the tariff was most significant. As a candidate Polk had declared for a tariff "sufficient to defray the expenses of the Government economically administered," the traditional party position. Contrary to the custom of naming tariff acts after the chairman of the Ways and Means Committee of the House, the tariff act of the Polk administration is known to history as the Walker Tariff because Robert J. Walker, secretary of the treasury, was its architect. This act placed the tariff on a revenue basis, the rates being lower than they had been since 1812. In his diary Polk wrote of its passage: "It has given rise to an immense struggle between the two great political parties . . . The capitalists and monopolists have not surrendered the immense advantage which they possess under the tariff of 1842 until after a fierce and mighty struggle." The tariff, thus enacted, increased the revenue of government, and the elimination of the protective features brought no industrial depression. So completely satisfied was the public that no one seriously suggested a change, and the Walker Tariff continued in operation until the Civil War. The bank controversy was also ended by the establishment of the independent treasury system (1846), and, with a few modifications, the principles underlying it have been retained ever since.

Slavery Issue, The.—In the presidential election of 1848 the Whigs again sought a candidate with no political record and found him in Gen. Zachary Taylor, one of the heroes of the Mexican War, who had neither voted nor given any thought seriously to political questions. Mass meetings to pay him homage had been held over the country, and he was dubbed Old Rough and Ready, which made an appeal. The Whigs had much difficulty qualifying him as a Whig, because he declined to express an opinion on the justice of the war and admitted that he was utterly ignorant of the merits of the issues of bank and tariff. He did say, however, that had he voted in 1844, he would have voted for Clay; so he was nominated, with Millard Fillmore as his running mate.

The Democrats nominated Lewis Cass, a distinguished statesman, who owed his first appointment to Jefferson and served in the Cabinet of Jackson. He held the party view on the bank, on the tariff, and on internal improvements by the national government. Devoted to the Union, Cass opposed the injection of the slavery question into politics.

The slavery issue was accentuated by the defeat of the Wilmot Proviso (1846), and the Democrats suffered for the first time through divisions on this issue. Martin Van Buren ran as an independent on the slavery issue and, though his vote was small, he secured enough to throw the electoral vote of New York and Penn-

sylvania to Taylor, who was elected. The slave states divided equally between Taylor, the slave owner, and Cass. Taylor died in less than two years and was succeeded by Fillmore. The whole of the Taylor-Fillmore administration revolved around the increasingly bitter slavery agitation culminating in Henry Clay's famous Compromise of 1850 to save the Union. The provision regarding fugitive slaves aroused bitter controversy, but Fillmore did all within his power to enforce it. Both parties were divided on the issue. The old issues were temporarily in eclipse.

In the presidential election of 1852, the Whigs again sought, and found in Gen. Winfield Scott, a military candidate with no conspicuous political record. The Democrats nominated Franklin Pierce, a man of robust patriotism, devoted to the Union and favorable to all compromises that might hold it together. Pierce was easily elected and the Whigs followed the Federalists into oblivion. Throughout the Pierce administration, the abolitionists and Southern extremists forced the slavery and sectional issue to the fore. The threat to the Union, foreseen and foretold by Clay, Webster, and Stephen A. Douglas, the ablest of the then living democratic leaders, began to take form. Conditions had become critical by 1856, the next presidential year.

Though Douglas loomed far above all others as the spokesman of the Jeffersonian and Jacksonian school of thought, the Democrats, in 1856, nominated James Buchanan, a statesman of stature and distinguished record in public station, who had been senator, minister to Russia and England, and secretary of state. That year the Democratic platform reiterated the traditional policies of the party but endorsed the construction of a railroad to the western coast (with government aid) as a measure of military necessity. It made the preservation of the Union the paramount issue, repudiating "all sectional parties and platforms concerning domestic slavery which seek to embroil the states and incite to treason and armed resistance to law in the territories, and whose avowed purpose, if consummated, must be civil war and disunion." The fact that the first Republican Convention (which nominated Gen. John C. Frémont) was composed almost wholly of Northern delegates tended to emphasize the sectional phase of the controversy. So thoroughly alarmed were many erstwhile enemies of the Democratic Party that old-line Whigs like Rufus Choate, by voice and pen, called for the election of Buchanan; Fletcher Webster, the son of the orator, announced his support, and the son of Henry Clay took the stump for the Democratic nominee.

The platform on which Buchanan was elected declared the Democratic Party "will abide and adhere to a faithful execution of the acts known as the compromise measures settled by the Congress in 1850, the act for reclaiming fugitive slaves from service labor included, which act, being designed to carry out an express provision of the Constitution, cannot, with fidelity thereto, be repealed or so changed as to destroy or impair its efficiency; that the Democratic Party will resist all attempts at renewing in Congress or out of it the agitation of the slavery question."

Dred Scott Decision, The.—Soon after Buchanan's inauguration came the Dred Scott decision of the Supreme Court (1857), and no party could have prevented the renewal of the agitation in its most extreme form. The ex-

tremists on both sides intensified their provocations, and a large part of the Democratic Party in the South broke with the more moderate section in the North. This was the state of the party when its National Convention met in Charleston, and the irreconcilable differences were such that no nomination was made. The Democrats met in Baltimore and nominated Stephen A. Douglas, and the southern element met a few days later and nominated John C. Breckenridge. The Douglas platform said that "inasmuch as differences of opinion exist in the Democratic Party as to the nature and extent of the powers of the Territorial legislatures and as to the powers and duties of Congress under the Constitution . . . over the institution of slavery within the Territories" it was resolved that "the Democratic Party will abide by the decisions of the Supreme Court on the question of constitutional law." It declared that the "enactments of State legislatures to defeat the faithful execution of the Fugitive Slave Law are hostile in character, subversive of the Constitution, and revolutionary in their effect." The Breckenridge platform adopted the exact phrasing of the Douglas platform on the Fugitive Slave Law but otherwise went the extreme sectional limit on the slavery question. Douglas, in a vigorous speaking campaign, carried his fight into the South, pleading for the preservation of the Union through compromise.

The Republicans nominated Abraham Lincoln, and, because of the division in the Democratic Party, he was elected.

Civil War, The.—When the predicted war eventuated, Douglas took the stump in an appeal to his followers to support Lincoln in the preservation of the Union. On his inauguration he sat beside Lincoln on the platform, holding the hat of his successful opponent. He continued his militant support until his death early in the Lincoln administration. During the war the Douglas Democrats did not abandon hope that a reconciliation of the sections could be effected and the war brought to a close. War measures beyond the Constitution were opposed, and the resort to military trials where civil courts were available was denounced. Amidst the passions of the war the Democratic Party of the North continued its traditional policy of supporting a strict construction of the Constitution and, while not successful at the time, it probably rendered a service to the nation in reminding the public that here was a fundamental law. In the Democratic Convention of 1864 the platform declared "unswerving fidelity to the Union under the Constitution as the only solid foundation of our strength, security and happiness as a people, and as a framework of government equally conducive to the welfare and prosperity of all the states both Northern and Southern." It proposed that, since four years of war had failed to restore the Union, immediate efforts should be made for a cessation of hostilities "with a view to an ultimate convention of all the states or other peaceable means" to restore the Union. It declared that "under the pretense of military necessity of a war power higher than the Constitution, the Constitution itself was being disregarded in every part and public liberty and private right alike trodden down."

That year the Democrats nominated Gen. George B. McClelland for president, and, though a powerful element in the Republican Party would have displaced Lincoln as its nominee, he was re-

nominated and elected. Because of the necessities of the war, it is unquestionably true that most of the Jeffersonian principles and policies had gone overboard in the flood. Because of the necessity of rapidly increasing industrial production for war purposes, a high protective tariff had been enacted; great fortunes were made, and the moneyed interests, on which the government was dependent for its extraordinary necessities, became more powerful than ever before. A powerful privileged class was in process of formation. The old Federalist principles were again in operation.

With the death of Lincoln, Andrew Johnson, the vice president, nominated as a war Democrat, succeeded. Like Tyler before him, he was a confirmed Democrat on all the fundamentals. This at once embroiled him with the party which had elected him.

Policy of Conciliation.—Lincoln's developing policy of conciliation, looking to the earliest possible restoration of the seceding states to full membership in the Union under the protection of the Constitution, was bitterly opposed by the major part of his party (known as the Radicals), who were preparing for a struggle with him at the time of his death. These hoped to divert Johnson from Lincoln's policy to the Radicals' plan for proscription and persecution, with the South held indefinitely under military rule. Johnson, able, courageous, determined, a thorough Jeffersonian Democrat as to the constitutional rights of the states, and whose primary interest in the war was the restoration of the Union, held to the Lincoln line. In the bitter struggle that followed, when the Radicals brought impeachment proceedings, he had the militant support of the Democrats in the Senate under the leadership of Thomas A. Hendricks and Allen G. Thurman, and these, with the aid of a few courageous Republican senators, who favored an early restoration of the Union, defeated the impeachment. Through the next ten years the Democrats continued an aggressive fight for the speedy readmission of the Southern states; the actual restoration of the Union; the return to constitutional government; and the termination of the military domination of the South. Sentiment was veering in the North, and in the congressional elections of 1866 the Democrats swept New York, New Jersey, Pennsylvania, and almost carried Ohio.

In the Democratic Convention of 1868, serious consideration was given to the nomination of Chief Justice Salmon P. Chase who had left the Democratic Party on the slavery issue, but who was fundamentally a Jeffersonian. President Johnson had strong support, but Horatio Seymour received the nomination for president. The Republicans nominated General Grant, who was elected.

Crédit Mobilier Scandal. The.—Grant's administration continued the military domination of the South. The greed of the beneficiaries of the high protective tariff increased with the ever growing demand for special privilege; the financial interests became more powerful and arrogant in government, and the railroad grafters had full swing, leading to the Crédit Mobilier scandal which involved numerous members of Congress and the speaker of the House. Bribery became commonplace. The Whisky Ring scandals broke, shocking the conscience of the nation. The consuming masses petitioned vainly for a reduction

in the tariff, and the miners mobilized against organized wealth. A great element in the Republican Party revolted, resulting in the nomination of Horace Greeley for president in 1872, and the Democratic Convention accepted his candidacy. This brought into the Democratic Party distinguished Republicans who remained thereafter, but many Democrats resented the nomination of an exponent of a high protective tariff, and Grant was re-elected.

Meanwhile, the Southern states, driven to desperation, began a militant fight for their constitutional rights; the evils of the Grant administration increased until members of the Cabinet were caught in corruption; and in the congressional elections of 1874 the Democrats carried the House of Representatives and Michael Kerr became the speaker.

Fraud of '76. The.—The prospects of the Democratic Party brightened, and in 1876 Samuel J. Tilden, conspicuous for his reforms as governor of New York, was nominated for president, with Thomas A. Hendricks as his running mate. Just before his nomination Tilden sounded a clarion call to the country which reflects the attitude of the party at this time:

"What the country now needs is a revival of Jeffersonian Democracy with the principles of government and the rules of administration and the high standard of official morality which was established by the political revolution of 1800. The demoralization of war—a spirit of gambling adventure engendered by a false system of public finance, a grasping centralization absorbing all functions from the local authorities, and assuming to control the industries of individuals by largesses to favored classes from the public treasury of money wrung from the body of the people by taxation, were then (before Jefferson's election) as now, characteristic of the period."

He added that the Jeffersonian principles had been submerged; those of Hamilton, assuming that all people should be governed by appeals to selfish interests in all forms of corrupt influence, had been revived.

The Republicans nominated Rutherford B. Hayes. In the election Tilden had an admitted majority of 250,000 votes. A fraudulent conspiracy immediately was hatched; the result was disputed as to the electoral vote. A commission composed of a majority of Republicans was formed, and in every contested case the vote was along party lines. Thus the "fraud of '76" was perpetrated, and Tilden, undoubtedly elected, was counted out. Tilden refused the passionate demand of his partisans that he proceed to Washington with his supporters and take over, on the ground that he did not wish another civil war.

In 1880 the Democrats made the mistake of not renominating Tilden, and the presidential nomination went to Gen. Winfield Scott Hancock who reduced the campaign to an absurdity with the statement that the tariff was "a local issue." Even so, he was defeated by a popular majority of only 10,000. The scandal of the fraud of '76 had sobered the people; the military domination of the South was ended; the Southern states resumed their place in the Union; and constitutional government was restored.

Tariff Revision.—In 1884 the Democratic Convention nominated Grover Cleveland for president and Thomas A. Hendricks for vice president. Cleveland had distinguished himself as governor of New York by his courage and his reforms. The Republicans nominated James G. Blaine, the most brilliant and magnetic of its leaders. Cleveland was elected with an electoral

majority of 37, though Blaine had a popular majority of 20,000. Aside from the reform of the civil service, so thoroughly done that it has not been materially changed since, the major act of Cleveland and the Democratic Party was an attempt to revise the tariff downward. The high tariff in operation since the early days of the Civil War had resulted in such a surplus in the Treasury as to be an actual embarrassment and an invitation to extravagance in expenditures. Cleveland opened the battle for revision in his message of December 1887 and, on the opening of the next session of Congress, on the eve of the presidential election of 1888, the Democratic majority in the House presented the reform tariff bill of Roger Q. Mills. In the Senate the Republicans countered with a demand for still higher tariff rates. The Mills bill passed the House but was defeated by the Republican Senate, and an issue was made. The campaign of 1888, with Cleveland again the Democratic nominee and Benjamin Harrison the Republican, was made on the tariff, and Harrison was elected.

Interpreting the result as a mandate to increase the protective tariff rates further, the first legislative act of the Harrison administration was the enactment of the McKinley tariff bill (1890). The industrial beneficiaries of the protective tariff made extravagant demands, and the result was a measure with rates so high that there was a popular protest, and in the congressional election of 1890 the Democrats swept the country. Cleveland's identification with tariff reform made him the nominee in the election of 1892, and running against Harrison, Cleveland was elected.

Party Perfidy.—The second Cleveland administration brought party cleavages. In accordance with the party pledge, a tariff bill, greatly reducing the existing rates, was presented by William L. Wilson. It passed the House and met with the approval of the president. In the Senate a small group of Democrats under the leadership of Arthur P. Gorman raised the rates and so emasculated the measure that Cleveland permitted it to become a law without his signature, making the comment that it reflected "party perfidy and party dishonor." The more important schism grew out of the repeal of the Sherman Purchasing Act promised by the Democratic platform, but with a pledge for bimetallism as well. The repeal was supported by members of both parties, but when the latter part of the pledge was ignored, there was a flare-up within both parties and a demand for bimetallism at a ratio of 16 to 1. In the meantime, partly because of this struggle, and partly because of a bond sale thought by some too profitable to Wall Street, Cleveland lost ground with a portion of his party who charged him with too close relations with the money power. This feeling was accentuated when, without notice from Governor John P. Altgeld of Illinois that the state was unable to prevent disorders growing out of the Pullman strike, Cleveland sent federal troops into the state. Altgeld, in a ringing protest, denounced the act as unconstitutional and an infringement on the sovereignty of the states. When Cleveland intervened with an injunction against the strikers, "government by injunction" became an issue having its effect on labor. The panic which began with the failure of the Baring Brothers in London and which was on the verge of breaking before Harrison left the White House struck soon after Cleveland's inauguration, and the de-

pression throughout his administration gave a gloomy aspect to Democratic prospects.

Bryan Campaign, The.—At a time of great tension, with passions running high, the two factions of the party squared off for decisive action in the Democratic Convention of 1896. In a speech of remarkable eloquence and passion, William Jennings Bryan, then 36, took the delegates by storm and was nominated for president. He remained the dominant leader of the party for the next 16 years, and, in the campaign of 1896, he revitalized the party and aroused the civic consciousness of the masses as never before since the Jackson campaign of 1832. While the money question was made the paramount issue, Bryan's unprecedented campaign tour was a crusade against privilege, protective tariffs, monopolies, federal interference in local affairs, and government by injunction; he spoke for an income tax, railroad regulation, and the popular election of senators. Fearful of the popular reaction to Bryan's campaign, the Republicans raised a campaign fund unapproached before in history, and manufacturers resorted, as in the days of Jackson, to coercion and intimidation. A portion of the Democratic Party, unwilling to support the high tariff views of William McKinley, the Republican nominee, nominated a ticket of its own in what was popularly called the Gold Bug Convention. Even so, Bryan's vote was two million in excess of that polled in the previous election, but McKinley was elected.

Events during the McKinley administration reshaped the issue in the presidential campaign of 1900. The Spanish War had awakened an imperialistic spirit in the people, and with the taking of the Philippines and Puerto Rico as spoils of war, the issue of "imperialism" became paramount. Bryan again was nominated by the convention of 1900. With the Democrats evoking the traditional American sentiment against imperialism, the Republicans countered with "let well enough alone," for the panic had passed and prosperity was returning. McKinley was re-elected.

Defeated twice under the dynamic and radical leadership of Bryan, the Democratic Party leaders in 1904 thought it well to appeal to the more conservative vote and, accordingly, nominated Alton B. Parker at the national convention in St. Louis. Though the platform adopted followed traditional Democratic lines, Parker was persuaded by Eastern advisers to telegraph the convention after his nomination repudiating the party's position on the money question. This alienated hundreds of thousands of Democrats and, though Bryan campaigned for Parker as the "lesser of two evils," Parker's defeat by Theodore Roosevelt, the Republican candidate, who had succeeded to the presidency in September 1901, after McKinley's assassination, was overwhelming.

The Democratic Party had learned its lesson and in its convention at Denver in 1908 turned again to Bryan, nominating John W. Kern for second place. The platform called for a reduction of the tariff to a revenue basis; for restriction of private monopolies; for a law prohibiting the duplication of directors among competing corporations; for better control over interstate commerce; for an income tax; for the popular election of senators; and for the end of government by injunction. It also promised a law prohibiting corporations from contributing to a campaign

fund and calling for the publication before election of campaign contributions in excess of a reasonable amount. Bryan's appeal to William H. Taft, the Republican nominee, to agree to the publication of campaign contributions before the election was ignored, but, in the absence of a law, the Democrats made their contributions public. Though again defeated, Bryan polled 1,300,000 more votes than had been cast for Parker in 1904.

Republican Tariff Revision.—Early in the Taft administration the Republican Congress passed the Payne-Aldrich Tariff bill, enormously increasing the protection of the privileged industrialists, though the Republican Party's pledge of a "revision" in the campaign had been popularly interpreted to mean a downward revision. A group of distinguished Republican senators including Albert J. Beveridge, Robert M. La Follette, Albert B. Cummins, Moses E. Clapp, and Joseph L. Bristow revolted and fought and voted against the bill. Its passage, followed by President Taft's characterization of the measure as the best in history, aroused such general indignation that in the congressional elections of 1910, the Democrats secured a large majority in the House, and Champ Clark became speaker, with Oscar W. Underwood chairman of the Ways and Means Committee in charge of tariff legislation. Since no tariff reduction measure could be passed in the Republican Senate, the Democrats submitted a number of separate measures dealing with the more obnoxious schedules, notably Schedule K, dealing with wool and woolen goods. These passed the Democratic House but were mangled in the Republican Senate. During the last half of the administration, when President Taft sponsored a Canadian Reciprocity bill, his major support came from the Democrats.

Democratic Reforms.—In 1912, Taft's claim to renomination was contested by Theodore Roosevelt, and when the latter was defeated in the Republican Convention, his followers launched a new party, the Progressive, popularly known as the Bull Moose Party, and nominated their favorite. This schism in the party opened the way to a Democratic triumph, and at the Baltimore convention the Democrats nominated Woodrow Wilson for president and Thomas R. Marshall for vice president. Wilson, who had opposed Bryan in his campaigns, declared before the convention that it was Bryan who had kept the flag of the Jeffersonian Party afloat, and the platform adopted was along the Bryan line. Wilson was elected, polling 8,193,019 votes to 4,119,507 for Roosevelt and 3,484,956 for Taft. The Democrats also got a majority in both House and Senate.

The first term of Wilson's administration was crowded with legislative achievement of the highest order. The Underwood Tariff bill was enacted (1913) in conformity with the traditional party principles. An income tax was adopted. Government by injunction was ended. For the guidance of the courts, labor was legally declared not a commodity. The Constitution was amended to provide for the popular election of senators. The Federal Reserve System, greatly strengthening the banking system and removing many old evils, was written in the statutes. The crying need of farmers for loans at a reasonable interest rate was met by the organization of farm loan banks. Not in generations had so many reforms been enacted in so short a time, and the domestic program of the administration was not completed

when World War I intervened.

League of Nations, The.—In 1916, Wilson was renominated by acclamation. In the early stage of World War I, the administration sought to maintain a policy of neutrality, but in the last days of Wilson's first term the provocative acts of Germany, involving American rights, were driving it toward war. That year the Republicans nominated Charles Evans Hughes who, after a bitter campaign, was defeated by a small margin. Soon after the second inauguration, the resumption of ruthless submarine warfare and the discovery of a plot to involve Mexico in a war against the United States, with the promise by Germany of American territory, forced the issue, and in April 1917, Wilson asked and got from Congress a declaration of war.

Throughout the remainder of the administration all issues centered on the war and the peace that was to follow, including the League of Nations which Wilson sponsored. In the waging of the war, miracles were performed with lightning rapidity, and a great army was created without the injection of party politics. Attending the Peace Congress in person, Wilson fought a successful battle to make the League of Nations a part of the peace treaty and returned home to urge favorable action by the Senate. Henry Cabot Lodge had organized an opposition to the League of Nations in the Senate, and made the League a party issue. A campaign of misrepresentation of the Covenant of the League was conducted through the press and in public speeches, and Wilson, desperately tired after his struggles in Paris, took the platform in a continental tour, answering the critics and pleading for the League as an instrument to prevent World War II. He was stricken on the tour and never wholly recovered. The United States, through the action of a few men in the Senate, refused to become a member of the League of Nations and doomed it to ultimate failure.

In 1920 the Democrats nominated James M. Cox for president and Franklin D. Roosevelt for vice president, while the Republicans nominated Warren G. Harding. The League of Nations was made the paramount issue of the campaign in which the enemies of the League appealed to racial resentments and elements for political purposes. Misrepresentations of the Covenant confused the people, and Harding was elected by a majority of 7 million. Thereafter big business was to be given free rein and the country lost its head in speculation. Serious scandals were disclosed, notably in the Teapot Dome oil barter, resulting in the imprisonment of a member of the Cabinet. The Democrats in Congress pressed and conducted congressional investigations with shocking revelations.

The prospects of a Democratic victory in the election of 1924 were excellent when the Democratic Convention in Madison Square Garden, New York City, became involved in the most acrimonious controversy since the Charleston Convention of 1860, in which a religious issue was injected because of the Ku Klux Klan. The contest between William G. McAdoo and Alfred E. Smith for the nomination held the convention for many days, intensifying factional dissensions. All prospects of victory had been frittered away when, at length, John W. Davis, the brilliant head of the American bar with a distinguished public record, was finally nominated for president. The platform reiterated the traditional

Democratic principles and arraigned the administration for corruption. But the bitterness engendered in the convention was projected into the campaign, and Calvin Coolidge, the Republican vice president who had succeeded to the presidency after Harding's death in 1923, was elected.

Religious Issue, The.—In 1928, the Democratic Convention at Houston nominated Alfred E. Smith for president and Senator Joseph T. Robinson for vice president. The platform was conspicuous in that it made no reference to the tariff. It denounced corruption in the public service; pledged the party to farm relief and to the development of internal waterways under the auspices of the government; and pledged the enforcement of the prohibition laws. The latter pledge was qualified, however, when Smith sent a telegram to the convention after his nomination, making clear his opposition to the 18th Amendment. The fact that Smith was the first Catholic to be nominated for president injected again a religious issue, all the more threatening because of the Klan. Smith met the issue in a courageous speech in Oklahoma City which tended to emphasize the divisions within the party. The result was the election of Herbert Hoover, the Republican nominee, and the loss to the Democrats of some Southern states.

The financial interests and the great corporations were now in the saddle with little government control. The spirit of speculation had reached fantastic proportions during the Coolidge administration and continued under that of Hoover. With the panic on the stock market in October 1929, one of the gravest depressions in history began, continued, and gradually grew worse during the next four years. The passage of another high protective tariff act by the Republican Congress was destructive of foreign trade. The victory of the Democrats in 1932 was inevitable, since they had won a notable victory in the congressional elections of 1930. At their convention in Chicago, Franklin D. Roosevelt was nominated for president against President Hoover, and the Democrats carried all but six of the 48 states in the election. No president in history has ever taken over in times so desperately critical. The nation was in desperate throes with many millions living on charity.

The Financial Crisis.—During the three administrations of Franklin D. Roosevelt, a revolution comparable with that of Jefferson in 1800 was wrought, having the same purpose: the consolidation and functioning of a real democracy. Policies were aimed at the extermination of privilege and the restoration of government to the people. At the time of the first inauguration, the banking fabric of the nation was near collapse. With dramatic decision, Roosevelt immediately ordered all banks closed until an investigation, speedily made, could determine their soundness. When this was established, they reopened with the guarantee of the government, and confidence was restored. This was followed by reforms in the banking laws for the better protection of depositors and the better service of the public.

Accepting responsibility of the national government for the maintenance of the unemployed, the necessary appropriation was speedily made, and a vast program of public works was launched. To end the chaos in business, which had contributed to the panic, the administration spon-

sored the NRA (National Recovery Administration) to control the competition which was endangering the business structure.

Acknowledging the necessity of a stock exchange for the transaction of legitimate business, the administration made drastic reforms in the methods, tending to create confidence and to remove the popular impression that it had become an irresponsible gambling institution.

Farm legislation was enacted to put agriculture on a par with industry and finance; social security legislation of an advanced nature was passed; labor was given a magna carta such as it never had previously; and the Muscle Shoals development was put in the service of the people over the protest of public utility interests. Applause was general in the first days of the administration until certain interests turned on Roosevelt with a bitterness never equaled since the days of Jefferson and Jackson.

In 1936 the Democratic Convention renominated Roosevelt and the Republicans named Governor Alfred M. Landon of Kansas. With the major part of the metropolitan press opposing the president, Roosevelt won an overwhelming victory not equaled since the days of Monroe by carrying all states except Maine and Vermont. This was accepted as a clear mandate from the people to proceed with the democratic reforms begun during the first administration. As the election of 1940 approached, there was no disposition among the Democrats to change leadership in the midst of the fight and turn the country over to an inexperienced man to steer it through the perils of World War II which had begun in September 1939. Consequently, the Democratic Party broke precedent by nominating Mr. Roosevelt for a third term. That year the Republicans nominated Wendell Willkie, a former Democrat, for the presidency. A bitter campaign followed but again the Democrats won by a great electoral majority.

World War II.—The third administration dealt largely with the problems of war, following Japan's attack upon Pearl Harbor. In the years that followed no nation in history had remotely approached the military and industrial achievements of the United States. The Republicans, for the most part, subordinated party politics to patriotic cooperation with the administration. Roosevelt and Prime Minister Winston Churchill of Great Britain came to be accepted throughout the world as the leaders of the democracies in the life and death struggle with totalitarianism. Mr. Roosevelt called to his aid outstanding Republican leaders who rendered loyal service, finding among them his secretary of war, Henry L. Stimson and his secretary of the navy, Frank Knox. In preparation for the ending of the war, plans were made under the inspiration of Roosevelt and the direction of Cordell Hull, secretary of state, for the formation of the United Nations to mobilize nations of good will against future threats to peace. In the midst of the fighting, plans were made for the reconversion of war industries to peace industry to prevent chaos in the economic field.

In 1944 the Democrats, supported by public opinion, renominated Roosevelt for the fourth time, so that his leadership would be uninterrupted throughout the war. The Republicans nominated Governor Thomas Dewey of New York. The campaign was waged with intemperance but resulted again in a Democratic victory.

Soon after his fourth inauguration, Roosevelt, harassed and worn out by his incessant fighting for twelve years, made the difficult journey to Yalta for a conference with Churchill and Stalin, and, on April 12, 1945, less than three months after his inauguration, he was stricken and died. He continued working to the moment of his death. He was succeeded by Harry S. Truman, who had been nominated for vice president in the convention of 1944. Truman immediately pledged himself to carry on the policies of his predecessor.

New Deal, The.—During the Roosevelt administrations, the fundamental principles of the Democratic Party indicated hitherto, sometimes observed bromidically, occasionally neglected entirely, were revived in all their pristine vigor. The system of democracy had come to be questioned as to its capacity to protect and to advance the interests of the average man. In his first campaign, Roosevelt had described him as the "forgotten man" and he described his program as that of the "New Deal." He set himself to the task of making democracy function for the common good. The fight for political democracy had been won in the days of Jefferson, long before the intensive industrialization of the nation, and the purpose of the Roosevelt policies was to extend democratic opportunity to the economic field.

Truman Administration.—The new president early evidenced his desire to carry forward the policies of Roosevelt in both the national and international fields. In international affairs he continued the bipartisan policy of his predecessor. He had not deviated from his pledge when the congressional elections of 1946 gave the opposition a majority in both branches of Congress. He met this congressional opposition with courageous vetoes and stinging messages of rebuke. Misinterpreting the sentiment of the people, the Republican-controlled Congress persevered in its efforts to combat the goals of the New Deal. It rejected the president's housing program and his proposals to fight inflation and reduce the dangerously high cost of living. It passed the Taft-Hartley Labor Act which nullified some of labor's gains under Roosevelt, particularly through the Wagner Act. Truman denounced this Congress as "the worst in history." Nominated by the Democrats in a disheartened convention, his defeat assumed as settled by almost all metropolitan papers and radio commentators reaching the public every day, he went to the people in one of the most aggressive fighting campaigns in history of any candidate except Bryan, traversing every section, emphatically proclaiming his loyalty to the Roosevelt tradition and policies, and inviting the people to choose between his policies and those of the Republican Congress he denounced. He was elected by more than 2,000,000 majority, and the Democrats regained control of both the House and the Senate.

The long life of the Democratic Party, extending unbroken over a century and a half, may be ascribed to the fact that the principles on which it was founded have made it the champion primarily of human rights, and the defender of the liberties of the people. Because of this elemental purpose, it has survived years of defeat and many mistakes, but on the whole has followed the line of its founder.

CLAUDE G. BOWERS,
U. S. Ambassador to Chile, Author of *"Jefferson and Hamilton—The Struggle for Democracy in America."*

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DEMOCRATIC SOCIETIES IN THE UNITED STATES, political associations in 1793 organized on the lines of the French Jacobin clubs (see JACOBIANS). Reflecting the ardent sympathy of Americans for France and the principles of the French Revolution, these clubs, organized in all important cities, clamored for an alliance with France, then being assailed by the rest of Europe. President Washington instead issued a neutrality proclamation, and in 1794 denounced the societies for having fostered the Whisky Rebellion (q.v.). The president's firm stand, the atrocities of the Reign of Terror, suppression of the Jacobin Club in Paris, and Robespierre's downfall and execution—perhaps also the fact that the craze had become a bore—caused the societies to disband in 1794–1795.

DEMOCRITUS, Greek philosopher of the new Eleatic school: b. Abdera, between 470 and 460 B.C.; d. 370 B.C. Some Magi and Chaldeans are said to have excited in Democritus the first inclination for philosophy. Of his numerous philosophical works mentioned by Diogenes Laertius (q.v.) only the titles and a few doubtful fragments are preserved. After the death of his father he traveled to Egypt, where he studied geometry and probably visited other countries, to extend his knowledge of nature.

In his system he developed still further the mechanical or atomical theory of his master Leucippus. Thus he explained the origin of the world by the eternal motion of an infinite number of invisible and indivisible bodies, atoms, which differ from one another in form, position and arrangement, and are alternately separated and combined by their motions in infinite space. In this way the universe was formed, fortuitously, without the interposition of a First Cause. Although denying the presence of design in nature, he admitted that of law. He called the common notion of chance a cover of human ignorance, the refuge of those who are too idle to think. The eternal existence of atoms (of matter in general) he inferred from the consideration that time could be conceived only as eternal and without beginning. In the atoms he distinguished figure, size, gravity and impenetrability. Fire consists, according to him, of active globules, and spreads, like a light envelope, round the earth. The soul consists, insofar as it is a moving power, of the finest fire-atoms; but since it is acquainted with the other elements, and anything can be known only by its equal, it must be composed in part also from the other elements. Knowledge by sense is due to contact with atoms emanating from the sensed objects, through the mediation of the organs of sense. Direct contact and mediated by the organs of sense, gives rise to "trueborn" knowledge. The continuation of the soul after death was denied by Democritus, who divided it into two parts: into the rational part, which has its seat in the breast; and the sensual part, which is diffused through the whole body. Both

constitute only one substance. He applied his atomical theory, also, to natural philosophy and astronomy. Even the gods he considered to have arisen from atoms and to be perishable like the rest of things existing. In his ethical philosophy Democritus considered the acquisition of peace of mind as the highest aim of existence. The purest joy and the truest happiness are only the fruit of the higher mental activity exerted in the endeavor to understand the nature of things, of the peace of mind arising from good actions and of a clear conscience. See EPICURUS; LEUCIPPUS.

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DEMOGEOT, dē-mō-zhō', Jacques Claude, French scholar: b. Paris, France, July 5, 1808; d. there, Jan. 9, 1894. He taught in the colleges at Beauvais, Rennes, Lyon, and in 1843 became professor of rhetoric at the Lycée Saint-Louis, which he left to take a chair in the faculty of letters at the Sorbonne. He wrote *Etude sur Pline le Jeune* (1845-1850); *les Lettres et l'Homme de lettres au XIX^e siècle* (1856); *Tableau de la littérature française au XVII^eème* (1859); and *Histoire de la littérature française depuis son origine jusqu'à nos jours* (1851). His poetical writings are a drama *Romeo et Juliet* (1852); *Contes et causeries en vers* (1862); and *Francesca da Rimini* (1882).

DEMOGORGON, dē-mō-gōr'gūn (from Gk. δαίμων, demon, and γοργός, horrible), a mysterious divinity in pagan mythology, viewed as an object of terror rather than of worship. He is first mentioned by Lactantius (or Lutatius) Placidus in a commentary on Publius Papinius Statius, about the 5th century A.D. By some he is regarded as the author of creation, and by others as a famous magician, to whose spell all the inhabitants of Hades were subjected. In Shelley's *Prometheus Unbound* it is this dread power of the Demogorgon that overthrows Jove.

DEMOGRAPHY, dē-mōg'rā-fī, the statistical study of populations. See VITAL STATISTICS.

DEMOISELLE, dēm-wā-zēl', the English name of a well known bird (*Anthropoides virgo*) of the Old World, so named because of its gracefulness and dainty habits. Nearly three feet in height, it differs from other cranes by having the head and neck more feathered, with long tufts of white feathers extending behind the eye and with black plumes on the breast. The rest of the plumage is ashy-gray. Although sometimes called the Numidian crane it breeds from Rumania and southern Russia eastward to many parts of Asia, occurring in Egypt only as a winter visitor. It is often kept in zoological gardens.

DEMOISELLE, is a name applied to any dragonflies properly called damselflies. They are slender, delicate, slow-flying species often found clinging to grasses and other plants around quiet water. The wings are similar in size and shape and fold vertically or obliquely over the back at rest. Nymphs have caudal gills.

DEMOISELLE, a fish. See SERGEANT-MAJOR.

DEMOIVRE, dē-mwā'vr', Abraham, French mathematician: b. Vitry, France, May 26, 1667; d. London, England, Nov. 27, 1754. He settled in London after the revocation of the Edict of Nantes and gained a livelihood by becoming a teacher of mathematics and solving problems. His chief works are *Miscellanea Analytica*; *The Doctrine of Chances, or a Method of Calculating the Probabilities of Events at Play*; and a work on *Annuities*; besides "Papers" in the *Transactions* of the Royal Society of which he was a fellow. He was selected by the Royal Society to arbitrate the dispute between Baron Gottfried Wilhelm von Leibniz and Sir Isaac Newton concerning the invention of infinitesimal calculus (q.v.). He is best known for his investigations on complex numbers, and the theorem $(\cos \theta + i \sin \theta)^n = \cos n\theta + i \sin n\theta$ that bears his name.

DEMON or **DAEMON** (Greek *daimon*), a spirit or "genius," one of a class of beings supposed to occupy a place midway between gods and men; or, according to Hesiod (*Works and Days*, lines 106-201), in the third rank of intelligent beings: men, heroes, daemons, and gods. (The general tendency of modern spelling is probably in the direction of *demon*, with the sense of evil spirit; *daemon* is used where the old, originally neutral sense is retained.) Homer uses the word even in referring to the gods, though never in the plural or in the feminine gender (both are common in later literature). The word connotes weird, supernatural, uncanny, unpredictable manifestations of power (somewhat like the Polynesian *mana*), and "explains" the occurrence of otherwise unaccountable events. The word was rarely used of the cult gods, for it implied too emotional or too changeable a mood on the part of the deity. Anthropomorphic gods, and the spirits of the dead, especially of kings and warriors, could be called either *theos* (god) or *daimon* (see Aeschylus, *The Persians*, lines 157 fol., 621 fol.). The word is even used almost with the sense of fate or destiny—as in the famous saying of Heraclitus (c.500 B.C.; cf. Epicharmus, Frag. 17), "A man's character is his daemon," that is, his destiny; sometimes it means Luck or Chance (the goddess Tyche). According to some writers, the immortals included gods and daemons; mortals included the heroes and other men. But according to Plutarch, as in his famous essay on *On the Cessation of Oracles* (sects. 10-13), the daemons have grown old and feeble, and are therefore presumably mortal; indeed he quotes Hesiod to prove this point. Since the daemons were responsible for giving the responses to inquiries at oracles, their age and feebleness accounted for the decline in the responses and the fact that they were now rarely given in inspired hexameter verse. A well-known passage in Plato's *Symposium* sets forth the view commonly held throughout the classical age and in later antiquity: "The whole daemonic nature is intermediate between the divine and the mortal . . . (possessing the power of) interpreting and transporting to the gods things human, and to men things divine; on one hand petitions and sacrifices, on the other commandments and returns for sacrifices. Being midway between both it fills up whatever is lacking to either, so that by it the whole is bound into one. By means of it the entire art of divination finds a place (that is, exists), and the skill of the priests in matters

relating to sacrifices and initiations and incantations and all kinds of soothsaying and sorcery God does *not* mingle with men [in spite of the myths!], but by this means all association and discourse of gods with men and of men with gods, whether waking or sleeping, takes place; and whoever possesses wisdom in these matters is a 'daemonic' [that is, spiritual] man—any other kind of wisdom, e.g. proficiency in some art or handicraft, is mere mechanical skill. And there are many such spirits [daemons] and many different kinds." (*Symposium*, 202e fol.)

The origin of the belief in daemons is hid in the mists of prehistory. When mankind emerged upon the stage of history, they were already, it is thought, in possession of such beliefs; that is, the "demonology" of historical times, which is found almost everywhere in the world, is simply the survival of beliefs held by "primitive" peoples (or rather, we should say, "prehistoric," since we know nothing of "primitive" mankind); for them every animal, plant, stone, river, spring, mountain, or human being was inhabited by a soul, which could, under certain circumstances, be detached from its occupied object. Not only were all the usual phenomena of nature looked upon as due to the activity or compulsion of such souls or "spirits" (*animae*), since prehistoric men knew nothing of the laws of nature, but also and especially, the unusual occurrences were attributed to such activity or prompting. The daemons were, by nature, neither good nor bad (compare the *Korndamonen* or *Korngeister* of Germanic folklore, or the ancient Greek "year-spirit," *Eniautosdaimon*). But later speculation made them "wicked," "unclean," or "evil" spirits, especially after the rise of monotheism, when the lesser gods were demoted to the rank of daemons and usually became wicked, protesting, or baneful spirits, and also following the ban upon sorcery, magic, necromancy, and the "black" arts generally—as among the Jews and also among educated Greeks and Romans.

The genus daemon has many species, in the world's religion and folklore. For example, the term was applied to human souls, especially to the souls of the departed, some of whom, as in the ancestor cults, received worship and offerings; and if angry—so especially were the ghosts or departed souls of those who lay unburied or who had died violent deaths (*biaiothanatoi*)—they were offered rites of conciliation and propitiation. Other daemons were the angelic hosts that people the skies, good spirits attendant upon the good gods, evil spirits that accompany Satan or the devil, as in Zoroastrian, Jewish, early Christian, and Islamic cosmology and eschatology. The evil daemons endeavored to occupy human bodies, in order to satisfy desires impossible to discarnate spirits: hence demonic possession, to which were attributed, especially in Jewish and early Christian folklore, most diseases and especially such as were of a mental or nervous character or were accompanied by marked emotional symptoms. In the Graeco-Roman world there was a widespread revival of popular demonology after the 3d century B.C.

On the other hand, tutelary or guardian spirits were sometimes described as daemons: e.g. the "genius" of the family, among the Romans, especially the genius of the imperial family, an idea which was basic to the whole concept of emperor worship, with which the early Christian church came into inevitable collision. In the

Roman period the daemon of a man was looked upon as his good or evil "genius" (the term is still used today, but without its original meaning); so Brutus met his daemon face to face before the fatal Battle of Philippi (Plutarch, *Brutus*; compare Plato, *Phaedo*). Late writers viewed Socrates' "daemon" as such a (good) spirit; in reality, for Socrates himself, it was only a kind of premonition or "hunch," an inner "voice" (see Plutarch's essay *On the Daemon* [*Genius*] of Socrates). Even buildings and cities, gates and doors, had their *genii*, usually thought of as incarnate in the tame house-serpent which—in the absence of cats, unknown to early Europe—guarded the household storechamber.

The methods used in exorcizing or expelling evil demons were usually magical, and often consisted of weird formulas. A common theory was that the naming of the demon gave one power over it. Hence the curious recital of all possible combinations of vowels and consonants in some of the magical formulas, and especially the naming of strange, exotic, and therefore powerful foreign deities—including, in the Greek magical papyri, the God of the Jews (spelled IAO or IAHO). Powerful drugs, strong incense, and terrible curses were also used. In contrast to popular usage, the exorcisms recorded in the gospels make appeal to faith in the power, goodness, and mercy of God.

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FREDERICK C. GRANT,
Union Theological Seminary.

DEMONETIZATION. See BIMETALISM.

DEMONIAC, dē-mō'nī-āk (from late Latin *daemoniacus*), a person supposedly possessed by a demon, his mind and body being either occupied or at least dominated by an evil spirit. Strange mental states or unusual physical powers were once attributed to such possession. See DEMON; WITCHCRAFT.

DEMONOLOGY, dē-mūn-ōl'ō-jī, either (1) the scientific study of the psychological phenomenon known as demon possession (see DEMON and WITCHCRAFT) or (2) belief in the reality and activity of demons and in the functions assigned to them in various religions and folkways. Belief in demons or disembodied spirits is widespread throughout the lower cultures; sanctioned by the Bible, such beliefs survive in various classical theological and philosophical systems. The Society for Psychical Research

(founded 1882) and other researchers have undertaken to investigate the phenomena reported. To date, however, it cannot be said that the investigations have established the scientific validity of the purported evidence.

DEMONSTRATION, dēm-ŭn-strā'shŭn, a proof in which the conclusion necessarily follows from the premises, and the rejection of the conclusion, therefore, always involves a contradiction. The great domain of demonstration is mathematics, in which all the proofs, however complicated, are drawn from a few simple axioms, founded on intuitive perception of number, time and space. In ordinary language, however, demonstration is often used as synonymous with proof and sometimes even more loosely as synonymous with explanation and exhibition, as when we speak of anatomical demonstration. In military tactics it is an operation which may be performed to the end of deceiving the enemy in regard to the real measures to be taken against it.

DEMOPHON, dēm'ō-fŏn, or **DEMOPHOON**, dē-mŏf'ō-ŏn, in mythology, the son of Celeus and Matanira, whom Ceres loved so passionately that she wanted to make him immortal. To attain that purpose she made him pass through fire, but, being disturbed by the cries of his mother, who chanced to see him, the goddess hurriedly mounted her car, leaving Demophon to perish in the flames.

DE MORGAN, dē mŏr'gān, **Augustus**, English mathematician: b. Madura, India, June 27, 1806; d. London, England, March 18, 1871. In 1828 he was appointed professor of mathematics in University College, or as it was then called, London University—a position which he held until 1866, with the exception of the five years from 1831 to 1836. Previous to this appointment he had turned his mathematical attainments to account in the service of some of the London assurance companies and continued throughout his life the confidential adviser of some of the most important of these associations. He was first president of the London Mathematical Society and was a member of the Royal Astronomical Society and did much to encourage a decimal system of coinage.

Among his many works are *Elements of Arithmetic* (1830); *Elements of Algebra* (1835); *Elements of Trigonometry* (1837); *Essay on Probabilities and on Their Application to Life Contingencies and Insurance Offices* (1838); *Formal Logic* (1847); and *Trigonometry and Double Algebra* (1849). A memoir was written by his widow (London 1882).

DE MORGAN, William Frend, English novelist: b. London, England, Nov. 16, 1839; d. Chelsea, Jan. 15, 1917. He was educated at University College School, was a student at the Royal Academy in 1859 and adopted art as a profession. In the years following 1864 he was chiefly engaged in stained glass work; in 1871 turned his attention to ceramic work, when his experiments in luster, at that time not much known in England, attracted some attention among artists. He manufactured pottery commercially from 1888 until his retirement. In 1906 he commenced as a writer of fiction with *Joseph Vance*, which achieved an immediate success. The novels that followed were equally

successful, so much so that De Morgan was soon regarded as one of the most popular and pleasing novelists of his generation. His other publications are *Alice-for-Short* (1907); *Somehow Good* (1908); *It Never Can Happen Again* (1909); *An Affair of Dishonor* (1910); *A Likely Story* (1912); *When Ghost Meets Ghost* (1914); and *The Old Man's Youth* (published posthumously).

DEMOSTHENES, dē-mŏs'thē-nēz, Athenian orator and statesman: b. Attica, Greece, 384 B.C.; d. Calavria, 322 B.C. His father, a successful manufacturer, died when Demosthenes was seven years old, but, despite his dishonest guardians, he received a standard education. On coming of age (18) he instituted suit against them. From this litigation, in which apparently he was only partially successful, five of his speeches survive (*Against Aphobus*, I-III; *Against Onetor*, I-II). These orations, by their style and method of argumentation, are convincing evidence that Demosthenes had studied under the noted orator Isacus. This instruction and practical experience launched him on the career of logographer (one who composed speeches to be delivered by litigants). The study required for writing speeches, often on important public issues, was excellent preparation for the political career on which Demosthenes had early decided. Public speaking, however, was difficult for him because of certain physical handicaps, including faulty enunciation. Many stories, probably apocryphal, were told of his efforts to overcome these defects by such means as declaiming with pebbles in his mouth or on the beach amid the roar of the waves.

In 351 Demosthenes delivered to the Assembly the speech known as the *First Philippic*, thereby inaugurating his crusade against Philip II of Macedon, with whom Athens had been waging a desultory war since 359. Philip's advance to the Propontis in 352 had convinced Demosthenes that he was a mortal enemy of Athens. In this oration he tried to arouse the Athenians to the Macedonian danger and, urging the rich to furnish money and the able-bodied to campaign in person, he advocated carrying the war to Thrace. His plea failed. In 349 Philip, determined to have control of Chalcidice, attacked Olynthus. In his three *Olynthiac Orations* Demosthenes urged his countrymen to aid the beleaguered city. Help was sent—too little and too late—and Olynthus fell in 348.

In 346 Demosthenes went to Macedon as one of 10 ambassadors who negotiated and carried through the Athenian Assembly the Peace of Philocrates. This peace, based on the status quo, benefited Philip greatly and it also excluded the Phocians, allies of the Athenians. When Philip shortly thereafter passed Thermopylae, overpowered the Phocians who in 356 had seized Delphi and its treasures, and received their seats in the Amphictyonic Council, Demosthenes blamed his fellow ambassadors, Philocrates and Aeschines, for the peace terms. After an abortive attempt to impeach Aeschines in 345 he renewed the charge in 343. The speeches of both (*On the Embassy*) are extant. Aeschines was barely acquitted, and henceforth an undying hatred existed between the two men.

To Demosthenes the Peace of Philocrates was only a stopgap to enable Athens to prepare for a renewal of war. In 344, hoping to counteract the growing influence of Philip, he stumped the

Peloponnese, and on his return he delivered the *Second Philippic*. The *Third Philippic* in 341 was probably the most brilliant of all his speeches. For the next three years he was the real leader at Athens. In 340 he was responsible for the annulment of the Peace of Philocrates and, to thwart Philip's designs in Thrace, he caused the Athenians to send help to Byzantium and Perinthus. He strengthened the Athenian Navy by pushing through a reform of the trierarchic system and had the theoric fund diverted to military purposes.

Trouble within the Amphictyonic League once again enabled Philip to interfere in Greece. In 339 he marched to Elatea in Phocis. Demosthenes, by emphasizing the potential threat to both Thebes and Athens, won over the former to an alliance. At Chaeronea in late summer 338 the allies, with Demosthenes serving as a hoplite, went down in defeat before Philip. Nevertheless the Athenians showed their approval of Demosthenes' leadership by choosing him to pronounce the funeral oration over those fallen in the battle—an oration which may be the one preserved in the manuscripts. In 336 Ctesiphon proposed that a golden crown be awarded to Demosthenes for his many services. The proposal was attacked as illegal by Aeschines, but, probably because of the unsettled political conditions, the suit did not come to trial until 330. The speeches of both Aeschines and Demosthenes survive. In the *De Corona* Demosthenes justified his political career and maintained eloquently that Athens had only been true to her traditions in leading the fight against tyranny. The Athenians received his words with such enthusiasm that Aeschines went into voluntary exile.

In 324 the Athenians arrested Harpalus, the absconding treasurer of Alexander the Great, and deposited his treasure on the Acropolis. After his escape and the discovery that half of the money was missing, Demosthenes was accused of having appropriated 20 talents. The evidence is confusing, but Demosthenes may have taken the money for political purposes. He was fined 50 talents. Unable to pay, he was imprisoned, but soon escaped into exile. After Alexander's death in 323, Demosthenes was active in arousing the Greeks against the Macedonians and was recalled to Athens with honor. The subsequent Lamian War ended disastrously for the Greeks. Demosthenes fled to the island of Calauria, where, tracked down by an agent of the Macedonian regent Antipater, he drank poison and died in the Temple of Poseidon.

As a statesman Demosthenes had one constant aim: the awakening of Athens and then of all Greece to the Macedonian threat. In the pursuance of that aim he was often unscrupulous, vindictive, and uncompromising, but to him the preservation of the free city-state way of life justified any means. The wisdom and vision of his policy may be questioned, but certainly the glory of the Greek struggle against Macedonian power—a more enlightened power than Demosthenes' hatred could realize—belongs chiefly to his courage, energy, patriotism, and eloquence. As an orator he was unsurpassed in antiquity. His speeches are characterized by lofty patriotism, lucidity of exposition, power, vividness, sarcasm, vitriolic abuse, and an all-consuming passion. The manuscripts have transmitted under his name 61 orations, 56 exordia, and 6 letters,

some of which are not his authentic works. Greek text and English translations are provided by seven volumes in the Loeb Classical Library (London 1926–1949).

Consult Pickard-Cambridge, A. W., *Demosthenes and the Last Days of Greek Freedom, 384–322 B.C.* (London 1914); Adams, C. D., *Demosthenes and his Influence* (New York 1927); Jaeger, W., *Demosthenes. The Origin and Growth of his Policy* (Berkeley 1938); Mathieu, G., *Démosthène. L'homme et l'oeuvre* (Paris 1948).

JOHN V. A. FINE,
Princeton University.

DEMOTIC ALPHABET. See **HIEROGLYPHICS.**

DEMOTIKA, DEMOTICA, dê-mōt'ikà, or **DIDYMOTEIKHON**, thê-thê-mō'tê-kôn, (Bulg. DIMOTIKA), town, Greece, in the Department of Evros, Thrace, on the Maritsa, about 23 miles south of Adrianople. A trading center for silk, wheat, barley, and tobacco, Demotika has some silk manufactures. In the town is the palace in which several of the Turkish sultans resided before they gained possession of Constantinople. Charles XII remained here for some time after the disaster of Pultowa. It was occupied during the Balkan War by the Bulgarians. The Treaty of London, May 31, 1913, confirmed the Bulgarian possession of the town, but it was later restored to Turkey by the Treaty of Constantinople, Sept. 29, 1913. In 1919, it was ceded to Greece. Pop. (1940) 8,457.

DEMPSEY, Jack (original name WILLIAM HARRISON DEMPSEY), American pugilist: b. Manassa, Colo., June 25, 1895. Called the "Manassa Mauler," he won the world heavyweight championship in 1919 by defeating Jess Willard. He defended his title against G. Carpentier (1921), Tom Gibbons (1923), and Luis Firpo (1923); but lost it to J. J. (Gene) Tunney in 1926. A year later Tunney again defeated him. After losing a decision to King Levinsky in 1932 Dempsey retired from the ring. Criticized for avoiding military service in World War I, he became a Coast Guard physical training officer in World War II.

DEMPSTER, Thomas, Scottish scholar: b. Cliftbog, Aberdeenshire, Scotland, Aug. 23, 1579; d. near Bologna, Italy, Sept. 6, 1625. His autobiography, which contains a curious mixture of truth and fiction, states that he became heir to the title of Baron of Muresk, but that the property accruing thereto had been fraudulently handled by his father and he was unable to regain it. Dempster's adherence to the Roman Catholic faith was one cause of his estrangement from his father. He studied at Cambridge, Paris, Louvain, Rome and Douay and became successively professor at Tournay, the College of Navarre at Paris, at Poitiers, Nîmes and again at various colleges of Paris. Quarrels forced him to leave Paris, and after a brief service as historian to James I of England he became professor of civil law at Pisa and later of humanities at Bologna—a period full of quarrels and scandalous duels. Urban VIII made him a knight and gave him a pension. He remained at Bologna until his death. Bayle says that though his business was only to teach a school he was as ready to draw his sword as his pen and as quarrelsome as if he had been a duelist by profession. Scarcely a

day passed, he adds, in which he did not fight either with his sword or at fisticuffs, so that he was the terror of all the schoolmasters. Dempster's works are very numerous and exhibit proofs of great erudition. Among them his *Historia Ecclesiastica Gentis Scotorum* is the best, though, instead of being as its title would indicate an ecclesiastical history of Scotland, it is merely a list of Scottish authors and Scottish saints. It is full of astounding inaccuracies and deliberate untruths. It was edited by the Bannatyne Club in 1829. His really most valuable work is *De Etruria Regali*, an edition of which was published at Florence in 1723. His Latin poems were also highly esteemed by his contemporaries.

DEMULCENTS, remedies of a mucilaginous nature that are used in inflammatory conditions of the mucous membrane. They consist largely of mixtures of the oils, gums, and albumins. Thus sweet oil, acacia, tragacanth, marshmallow, slippery elm, white of egg, cream, milk, and flaxseed are all types of this class of remedies.

DEMURRAGE, in maritime law, is used to signify the amount to be paid by the charterer to the owner of a ship for detaining her in port longer than the time specified. The time of delay in port, such as for cargo or convoy, is usually stipulated in the charter party and also the allowance to be made in case of longer delay for those objects; and this time is sometimes specified in working days or lay days, as distinguished from holy days when no cargo can be put on board. All ordinary cases of detention, such as port regulations, the overcrowded state of the harbor, or even from the unlawful acts of the customhouse officers, are at the freighter's risk, and demurrage must be paid, although it is proved that the delay was not caused by any fault of his. But demurrage cannot be claimed when the ship is detained by a public enemy, by the hostile occupation of the port, or if the detention is caused by the owner, master, or crew. The claim ceases whenever the vessel is cleared and ready for sailing, though she should be detained by adverse winds or rough weather.

DEMURRER, a pause or stop put to the proceedings of an action upon a point of difficulty, which must be determined by the court before any further proceedings can be had therein. He that demurs in law confesses the facts to be true as stated by the opposite party, but denies that by the law arising upon those facts any injury is done to the party or that he has made out a lawful excuse. *Demurrer to evidence* is a statement by the party making it that he will not proceed because the evidence on the other side is not sufficient to maintain the issue. A *general demurrer* is one not specifying an objection, but relying on some defect in substance; a *special demurrer* specifies some particular defect in the form of the adversary's allegation. A demurrer, when allowed, puts an end to the suit, unless it is confined to only a part of the bill. If overruled, a fresh defense is required. Generally there is a provision that the counsel must certify that the demurrer is well founded in law and an affidavit must be made by the defendant that it is not interposed for delay.

DEMY, dê-mî'. (1) The popular term for the *demi-socii* or half-scholarships of Magdalen

College, Oxford—the seniors valued at \$500 and the juniors at \$400 a year. (2) A term designating American writing paper 16 by 21 inches

DENAIN, dê-nân', town, France, in the Department of Nord, about eight miles southwest from Valenciennes, on the left bank of the Schelde, which is here navigable. It stands in the center of a coalfield, and both coal and iron are extensively mined and supply several blast furnaces and other ironworks. Shipbuilding and manufacture of beet sugar, beer, and spirits are other industries. Denain had a celebrated abbey, founded in 764. A great victory was gained here in 1712 by the French under Marshal Villars over Prince Eugene of Savoy in the War of Spanish Succession. Denain is the largest of the seven towns which comprise the canton of the same name. Pop. (1946) canton: 49,083; town: 24,908.

DENARIUS, dê-nâr'î-ûs, the principal silver coin of the late Roman Republic and the early Roman Empire. It was struck first about 187 B.C. The obverse bore the helmeted head of Bellona (q.v.) and the numeral X, which latter signified that the coin equaled 10 bronze asses (see As) in value—the as then weighing about two ounces; the reverse showed the Dioscuri (q.v.) charging on their steeds. By the end of the republic (27 B.C.) other representations—both mythological and historical and personal—appeared on the coin; in the empire it carried imperial portraits. About the Social War (90–88 B.C.) the denarius was debased and in the empire (from 27 B.C.) suffered further devaluation, particularly under Nero (r. 54–68 A.D.) and Lucius Septimius Severus (r. 193–211). Caracalla in 215 issued a double denarius (the Antoninianus—the adjectival form of his surname Antoninus), which weighed about one and one-half denarii, but which ceased to be minted after 274, when Aurelian temporarily stabilized the coinage. Thereafter the denarius disappeared, though silver coins under other names were coined.

The denarius appears in the New Testament as penny (Authorized and Douay versions), shilling (American Standard Version), and denarius (Revised Standard Version).

P. R. COLEMAN-NORTON,
Princeton University.

DENATURED ALCOHOL refers to ethyl alcohol which has been rendered unfit for beverage purposes by the addition of various substances, so that a tax-free product may be sold to industry. The term "alcohol" has but one meaning to the general public, that being the base for a chemical compound made for centuries by fermentation and in more recent years also by chemical synthesis, which has the composition C_2H_5OH and is variously referred to as ethyl alcohol, ethanol, grain alcohol, cologne spirits, and spirits of wine. When a chemist speaks of alcohol with no other qualifying word, this is the compound meant, but the term also covers a general type of organic chemicals having a specific structure in which the hydroxyl (OH) group confers definite chemical properties. This is a common cause of confusion on the part of those untrained in chemistry and has occasionally resulted fatally. No other alcohol other than

ethanol is present in any appreciable amounts in standard alcoholic beverages. (See ALCOHOL.)

The term "denatured alcohol" is practically synonymous with "industrial alcohol," since very little alcohol free of denaturants (and taxed many times its cost to prevent diversion to beverage use) is bought by industry.

Production.—Alcohol production is commonly reported in terms of wine gallons of 190 proof material. A wine gallon means 231 cubic inches, while proof is a value double the percentage by volume of alcohol in the product. For some purposes the product must be free of water and is thus 100 per cent or 200 proof.

Sources.—There are two major sources of industrial alcohol: fermentation and synthesis from petroleum refinery gases. The production capacity of that portion of the alcohol industry which depends on fermentation methods is somewhat over 100 million gallons per year. The chief raw material of this industry is ordinary molasses from the sugar industry. The term "molasses" refers to a product from which sugar cannot be profitably recovered. In industry there is a sharp distinction between molasses and table sirup. The fermentation process and subsequent distilling operations of alcohol are described in another article.

The synthetic process by which alcohol is made from ethylene (C_2H_4 or $CH_2:CH_2$), a major ingredient of petroleum refinery gases, accounts for considerably more than half of industrial alcohol production and can be readily expanded, if there is unusual need.

Under ordinary conditions hydrocarbons containing four carbon atoms, mainly butane (C_4H_{10}), are an adequate source of butadiene for the synthetic rubber industry, but during the war period from 1941 to 1945 it was necessary to make large quantities of butadiene from alcohol.

As early as 1855 in Great Britain provisions were made for the practice, now quite general in world industry, of adding to alcohol materials that would make possible exemption from the heavy excise taxes on alcoholic beverages.

In recent years the tendency has been away from making such denatured products toxic, the idea being to make them completely unpalatable on the basis of either taste or odor.

Uses.—Completely denatured alcohol (c.d.) is a material that may be sold to the general public without any special restriction other than the requirement that dealers handling the product in quantity shall keep adequate records of receipts, storage, and distribution. During the period when large quantities of wood were destructively distilled to make methanol and acetic acid, byproduct materials known as "pyroligneous bodies" were common denaturants, but the greatly reduced extent of this industry has led to increased proportions of synthetic chemicals for this purpose. In addition to kerosene, common denaturants other than wood products are such substances as methyl isobutyl ketone and acetaldehyde (hydroxybutyraldehyde). The proportion of completely denatured alcohol in the industrial alcohol market is now relatively small.

The tendency in this industry is now largely in the direction of adapting the denaturant to the particular needs of each industry, the product being referred to as "specially denatured" (s.d.). In very broad terms this involves the addition of some material that does not interfere with the process. The alcohol may be recovered from

the process and reused, or it may be an essential ingredient of the final product. There is a large number of specially denatured alcohol formulas and authorized uses.

Alcohol is particularly valuable as a solvent. The most common denaturant for this purpose is methanol in amounts never exceeding 10 gallons per 100 gallons of alcohol. Other common denaturants are gasoline, benzene, acetone, and other ketones. Fuel alcohol may be most conveniently denatured with gasoline. Where the solvent alcohol remains in the final product, special denaturants may include other ingredients, examples being pine tar, soap, glycerine, camphor, and menthol in toilet preparations; iodine in its tinctures; essential oils in tooth pastes, mouth washes, liniments, and perfumes; and nicotine in agricultural sprays.

When alcohol actually enters into chemical reactions and is consumed, as in the manufacture of many chemicals, a second raw material required in the process may be added in small quantities. Typical instances include: organic acids in ester manufacture, sulphuric acid in making diethyl ether; and acetaldehyde in producing butadiene.

Regulations.—Government and charitable organizations, educational institutions, and laboratories engaged in scientific research may obtain tax-free alcohol from a bonded warehouse. Such users furnish bonds in amounts proportional to the quantities used. Strict accounting is made for all that is purchased, stored, or consumed.

There are special regulations covering specially denatured alcohol, buyers being required to give complete information regarding processes and uses. The whole procedure is quite flexible and changes continually are made to meet particular needs. In processes into which alcohol is introduced as a diluent, a dehydrating agent, or a vehicle, and in which the alcohol is recovered and reused, special regulations are enforced including bonding and, in some cases, official supervision.

Consult U.S. Dept. of the Treasury, Commissioner of Internal Revenue, *Annual Report* (Washington); U.S. Tariff Commission, *Report M-1*, Regulations No. 3, Industrial Alcohol, and Industrial Material Series, Industrial Alcohol (Washington, Sept. 1951).

W. T. READ,
Chemical Adviser, Research and Development Division, General Staff, Department of the Army

DENBIGH, dĕn'bĭ, Wales. (1) Maritime county of northeast Wales; area about 669 square miles. Oats, barley, and rye are the principal crops; sheep are raised in the uplands; and woollens are manufactured. The principal industry is mining, coal, iron, lead, and slate being extensively worked. The county is divided into two divisions for parliamentary purposes, each returning one member. Pop. (1951) 170,699.

(2) Municipal borough, capital of the county of Denbigh. Agriculture is the main industry. The town contains ruins of a 13th century Norman castle. Pop. (1951) 8,127.

DENBY, Charles, American diplomatist: b. Mount Joy, Va., June 16, 1830; d. Jamestown, N.Y., Jan. 13, 1904. He was educated at Georgetown University and Virginia Military Institute and became a lawyer. Having served through the Civil War and attained the rank of colonel, he resumed the practice of law. He was ap-

pointed minister to China in 1885 and served for 13 years in Peking. In 1898 he was a member of the commission to investigate the conduct of the Spanish-American War, and in 1899 was made a member of the Philippine Commission. During the Sino-Japanese War (1894-1895) the Japanese government placed its interests in China in his care. He wrote *China and Her People*, 2 vols. (1906).

DENBY, Edwin, American politician: b. Evansville, Ind., Feb. 18, 1870; d. Detroit, Mich., Feb. 8, 1929. After seven years (1887-1894) of employment in the customs service of China, while his father was United States minister there, he was graduated in law from the University of Michigan in 1896. He practiced law until and after the Spanish-American War, wherein he was a sailor. Denby then served in the Michigan (1903-1905) and the national House of Representatives (1905-1911), after which he resumed law practice in Detroit. He was appointed secretary of the navy in 1921, but in 1924 resigned as a result of the Teapot Dome Scandal (see *SECRET SERVICE, UNITED STATES*), which was revealed after he had allowed the transfer of the administration of the navy's oil reserves to the Department of the Interior. Denby was not charged with corruption, but his adversaries accused him of stupidity.

DENDERA, dān'dī-rō (ancient Tentyra), Egypt, a village on the left bank of the Nile opposite Qena. It is celebrated for its temple, one of the most magnificent and best preserved remains in Egypt, begun under Ptolemy XI (r. 80-51 B.C.) and completed under the Roman Emperor Augustus (r. 27 B.C.-14 A.D.), but much of the decoration was added later. It was dedicated to the goddess Hathor (Aphrodite) and is enclosed within a wall built of sun-dried bricks, in some parts 35 feet high and 15 feet thick. The portico of the temple consists of 24 columns, in three rows four deep on either side, each above 22 feet in circumference, and 50 feet high. The interior consists of a number of apartments, all the walls and ceilings of which are covered with religious and astronomical representations, including the figure of Hathor. The roofs are flat, and are formed of oblong masses of stone resting on the side walls, or on rows of columns (carried down the middle of the building), whose capitals are richly ornamented with the budding lotus. The only light admitted to the interior was by small perpendicular holes cut in the ceiling or by oblique apertures in the sides. The hieroglyphics and ornamentation of the temple belong to the declining period of Egyptian art. The effect of the portico is greatly heightened by the fact of its roof being retained; and on the ceiling is the famous zodiac, at one time regarded as of great antiquity. Another remarkable object belonging to the temple, and which excited the greatest interest, was a celestial planisphere or zodiac, forming the ceiling of one of the upper chambers. This was removed in 1820 and is in the Bibliothèque Nationale in Paris. Sir Flinders Petrie in 1893 excavated the tombs of the ancient princes of Dendera.

Consult Mariette, Auguste F. F., *Dendérah*, 6 vols. (Alexandria, Egypt, 1873-75).

DENDERMONDE, dēn-dēr-mōn'dē, or **TERMONDE**, tēr-mōnd', Belgium, town in the

Province of East Flanders at the junction of the Dender and the Schelde rivers, 17 miles northwest from Brussels. It is strongly fortified, defended by a citadel, and surrounded by low, marshy ground which can be inundated. It contains manufactories of woolen and linen goods, tobacco, and other articles. It is an important railroad center. It possesses a college, a public library, an academy of design and architecture, a music school, a fine church in which are a number of paintings by Van Dyck and De Crayer, and a remarkably decorated townhall of the 14th century. Pop. (1948 est.) 9,330.

DENDRERPETON, dēn-drēr'pē-tōn, a Paleozoic or stegocephalian armored amphibian belonging to the order Labyrinthodonta (q.v.). Its fossilized remains are found in Upper Carboniferous (Pennsylvanian) fresh-water formations in Nova Scotia and in central Europe. Several species, mostly some 15-25 inches in length, have been described. The genus was apparently chiefly terrestrial in habit.

DENDRITE, dēn'drīt, in mineralogy (1) crystals formed during solidification, having many branches; and (2) a treelike formation, often of great delicacy and beauty. Snowflakes are classed as symmetrical dendrites. It is one of the commonest modes of growth which crystals of every possible symmetry and chemical composition assume. Dendrites are almost invariably the rule in metals, are common in crystals grown from solution, melt, and vapor, and exist in endless variations. The term "dendrite" is used for similar forms even when not crystalline, as in the dendrites of manganese oxide, which form on surfaces of limestone or are enclosed in moss agates.

ALVIN S. COHAN.

DENDRITIC DRAINAGE. See *TRELISED DRAINAGE*.

DENDROBATES, dēn-drōb'ā-tēz, a genus of tree frogs occurring only in Central and South America. Of small size and often brightly colored, its members, which are toothless, have webless toes terminating in adhesive disks to aid them in their arboreal life. When molested, the skins of these amphibia exude a protective secretion, a poison—or rather the uses to which man has put it—for which the group is famous. Indians expose these frogs to a fire whose heat causes copious exudation of the poison, which they scrape off with a knife and apply to arrowheads to make them lethal. The dermal secretion of *Dendrobates tinctorius* is also employed to vary the coloring of the Amazon green parrots in fanciful fashion. Patches of the birds' feathers are pulled out and either a living frog or some of the poison is applied to the bare skin; sometimes the process is repeated when the new feathers—yellow instead of green—appear. These frogs spawn in shallow pools. When a pool shows signs of desiccation, the tadpoles, by means of their suckerlike mouths, attach themselves to the male parent, who then transports them to a more promising pool in which they complete their metamorphosis. Formerly *Dendrobates* was regarded as representative of an unnatural assemblage of frogs known as Dendrobatidae. Now, together with the Brachycephalidae, they are customarily included in the Atelopidae.

DENDROLAGUS, dĕn-drŏl'ă-gŭs a genus of marsupial animals, popularly known as tree kangaroos, from their habit of living in trees. Their forelegs are longer and stouter in proportion than are those of the kangaroo, and their hindlegs are shorter. They move in the treetops with a jumping motion of the hindlegs, clinging to the landing place with the forelegs, which are armed with long sharp claws. Four species are known, one of them (*D. lumholtzi*) being a native of northern Queensland, and the other three (*D. ursinus*, *inustus* and *dorianus*) natives of the island of New Guinea.

DENFELD, Louis Emil, American naval officer. b. Westboro, Mass., Apr. 13, 1891. Graduating at Annapolis in 1912, he advanced through grades to rear admiral in 1942. On destroyer escort duty during World War I, at the outbreak of World War II he was in command of Destroyer Division 18 and Destroyer Squadron 1 (1939-1941). In 1942 he became assistant chief of the bureau of naval personnel, and on Sept. 15, 1945, promoted vice admiral, headed the bureau, supervising navy demobilization. On Sept. 24, 1946, with rank of admiral, he succeeded Admiral J. H. Towers as Pacific Fleet commander. On Dec. 15, 1947 he succeeded Admiral Chester W. Nimitz as chief of naval operations until his resignation on March 1, 1950. His successor was Forrest P. Sherman.

DENGUE, dĕng'gā, **FEVER** (also called dandy, breakbone, and seven-day fever, scarlatina rheumatica, abu rokab), a specific disease usually distinguished by an acute onset with fever, intense muscular and joint pains, and later by a measleslike eruption. In some countries it is endemic and has three times assumed pandemic proportions. It is found in Eastern countries—Arabia, China, India, Africa, especially in Egypt and Zanzibar. It has been found in Spain, Greece, and Asia Minor; in Bermuda, the West Indies, the southern United States; in parts of South America; and in Sydney and Brisbane, Australia. It is essentially a disease of the tropics, where it is usually found in hot weather, in the coast and river districts and low levels more than in inland parts; and it would seem to be a communicable disease.

DENHAM, dĕn'ām, Dixon, English explorer: b. London, Jan. 1, 1786; d. Sierra Leone, May 8, 1828. He was educated at Merchant Taylors' School with a view to entering business, but joined the army in 1811, and fought in the Peninsular campaign and in the Netherlands. In 1823-1824 he was engaged, in company with Capt. Hugh Clapperton and Dr. Walter Oudney, in exploring the central regions of Africa. The account of the expedition was prepared by Denham, and published under the title *Narrative of Travels and Discoveries in Northern and Central Africa* (1826).

DENHAM, Sir John, English poet: b. Dublin, Ireland, 1615; d. London, March 19, 1669. He was the son of Sir John Denham, chief baron of the exchequer in Ireland, and was educated in London and at Oxford. In 1642 he first became known by his tragedy *The Sophy*. This piece was so much admired that Waller observed, "Denham had broken out like the Irish rebellion 60,000 strong, when no person suspected it." In

1642 he published the first edition of his most celebrated poem, called *Cooper's Hill*. Among the last and best of his productions is a poem in which he commemorated the death of Abraham Cowley. In 1665 a corrected edition of his works appeared. He was forced to escape to France in 1648 because of his implication in the secret service of Charles I. Returning to England in 1652, he was appointed after the Restoration as surveyor general of the royal buildings. His tomb is at Westminster Abbey. His poetry is remarkable for its rhythmic flow and smoothness, leading up sometimes to passages of force and dignity.

DENHARDT, dĕn'hārt, or DENHART, Clemens and Gustav, German explorers: b. Zeitz, Aug. 3, 1852 and June 13, 1856, respectively; Clemens d. June 7, 1929; Gustav d. Leipzig, July 19, 1917. They traveled in 1878 through the Tana River region, East Africa, and in 1885 from Lamu Island to Vitu to establish German trade, the sultan of the Swahili desiring a treaty with Germany based upon proposals made by him 18 years before. Clemens Denhardt transferred part of the territory acquired by him to the German Colonist Society, the Deutsche Witugesellschaft. All rights to this territory were ceded by Germany to England in 1890, in exchange for the island of Helgoland, the brothers receiving an indemnity of 150,000 marks from the German government.

DENIA, dā'nyā, Spain, seaport commune on the east coast of Alicante. Roman antiquities abound in the neighborhood. The harbor is small and there is a lighthouse. Raisins and salt are the principal articles of commerce. Pop. (1941 est.) 12,323.

DE NICOLA, Enrico, Italian lawyer and first president of the Italian Republic: b. Naples, Nov. 9, 1877. Receiving his law degree at 18, he devoted himself to the criminal branch of his profession and to political journalism. Elected deputy for Afragola in 1909, he was re-elected in 1913, 1919, and 1921. Prior to the Fascist regime he was for several years president of the Chamber, during which period he repeatedly declined invitations of King Victor Emmanuel III to form governments. His anti-Fascist principles led him to retire from politics in 1924 when Benito Mussolini obtained the power. However, in 1929 he accepted senatorial rank. After the fall of fascism he took the initiative in persuading the king to abdicate in 1944, but otherwise remained aloof from political activities. A member of the Liberal Party and of moderate republican tendencies, but generally considered nonpartisan, he was elected provisional president of the Italian Republic on June 28, 1946. Of the 504 votes cast, 396 were for De Nicola. On July 14 he swore in the first Italian Republic government headed by Dr. Alcide de Gasperi and comprising 8 Christian Democrats, 4 Communists, 4 Socialists, 2 Republicans, and 1 Independent. President De Nicola's election resulted from a compromise among the Christian Democrats, Socialists, and Communists. *

DENINA, dā-nē'nā, Giacomo Maria Carlo, Italian historian: b. Revello, Piedmont, Feb. 28, 1731; d. Paris, Dec. 5, 1813. He studied at Turin, and in 1758 became a professor in the university there. He published *Rivoluzioni d'Italia* (1768-1772) in three volumes, his most important work.

In 1782 he went to Berlin. Other publications include *Prusse littéraire sous Frédéric II* (1790–1791) and *Storia delle rivoluzioni in Germania*. About 1804 he was appointed to the position of librarian to Emperor Napoleon.

DENIS or **DENYS**, **Saint**, *sânt dën'is*, first bishop of Paris, and patron saint of the French nation. Exact information regarding Saint Denis cannot be obtained, but there is no doubt that he belonged to the 3d century. In the Middle Ages it was erroneously believed by many that Saint Denis of Paris was the same as the Dionysius converted at Athens by Saint Paul. The most reliable authorities say that Saint Denis of Paris was sent by the pope to Gaul about 250 A.D. His mission was successful and many pagans were converted to Christianity. The number of his disciples attracted the attention of the Roman governor, and Saint Denis was martyred but was given an honorable burial by a matron named Catulla. Later a church was built over the place where the bodies were interred. Early in the 7th century Dagobert I built an abbey there. His feast is celebrated on October 9.

DENIS, **Louise Mignot**, niece and companion of Voltaire: b. Paris, 1712; d. there 1790. Six years after her marriage in 1738 Madame Denis was widowed. Although very poor, she had a gay and lively disposition and after the death of Mme. du Chatêlet became a favorite of Voltaire with whom she traveled in Germany and Switzerland. At Ferney she played leading roles in the little theatrical company her uncle organized. Whatever may have been the degree of intimacy between them, it is known that she had sentimental relations with several of his friends and with his secretary, Ximénès. In 1778 Mme. Denis accompanied the aged philosopher to Paris and was the legatee of his estate. She bequeathed the famous statue of Voltaire by Houdon to the Comédie-Française. She was author of the comedy *La Coquette punie*.

DENIS, **Maurice**, French painter: b. Granville, France, Nov. 25, 1870; d. Paris, Nov. 13, 1943. One of the original symbolists, he is best known for his murals in various churches and the Théâtre des Champs Elysées. He has also made beautiful colored lithograph illustrations for *The Imitation of Christ*, *Little Flowers of St. Francis*, and the *Life of St. Dominick*. His manner is a skilful combination of the archaic and modern. He published *Théories* (1890–1910), a book of critical essays, *Du Symbolisme et de Gauguin, vers un nouvel ordre classique* (1912), *Nouvelles théories sur l'art moderne, sur l'art sacré* (1914–1921), *Aristide Maillol* (1925), *Charmes et leçons de l'Italie* (1935), and *l'Histoire de l'Art Religieux* (1939).

DENIS, **Michael**, Austrian poet: b. Schärding, Sept. 27, 1729; d. Vienna, Sept. 29, 1800. Educated by the Jesuits, he became professor in the Theresianum in Vienna after entering the order in 1759. He became custodian of the court library in 1784 and in 1791 was promoted to librarian. He was author of *Die Lieder Sineds des Barden* (1772).

DENISON, **George Taylor**, Canadian soldier and publicist: b. Toronto, Aug. 31, 1839; d. there, June 6, 1925. He was educated at Toronto

University, was called to the bar in 1861, and practiced in Toronto. In 1877 he was appointed police magistrate of the city. In 1872 and 1873 he was sent to England as commissioner in behalf of immigration. He began his military service in 1855, was made lieutenant colonel in 1866, and was in active service in the Fenian raid of 1866 and Riel's Rebellion of 1885.

His *History of Cavalry* (1877) won the first prize offered by the emperor of Russia for the best book on the subject; he also wrote *The Fenian Raid at Fort Erie* (1866); *Soldiering in Canada* (1900), and *The Struggle for Imperial Unity* (1909). He was one of the founders of the Canada First Party, and through his contributions to periodical literature and public addresses was known as an earnest advocate of Canada's rights and of the preservation of the unity of the empire.

DENISON, city, Iowa, Crawford County seat; altitude 1,170 feet; on the Chicago and North Western and the Illinois Central railroads; 58 miles north-northwest of Council Bluffs. Located in a farming section, it produces corn, oats, and wheat. The city's industries include hand-made furniture, bottling works, and a flour mill. There is a fair ground, a Carnegie library, and a collection of pioneer relics housed in an old log cabin in Washington Park. Denison was founded in 1855 by J. W. Denison, a Baptist minister. It has a mayor and council. Pop. (1940) 4,361; (1950) 4,554.

DENISON, city, Texas, Grayson County; altitude 767 feet; on the Denison and Pacific Suburban, the Kansas, Oklahoma and Gulf of Texas, the Missouri-Kansas-Texas of Texas, the St. Louis, San Francisco and Texas, the Texas and New Orleans, and the Texas and Pacific railroads, 10 miles north of Sherman. Denison has railroad shops and offices, and is an important shipping point for products of the agricultural region in which it is located, especially cheese and dairy products, peanut butter, biscuits, shortening, and processed pecans and peanuts. Important work in grape culture has been done in this area. Manufactures include power saws and cotton duck.

Denison Dam, located about four miles north of Denison, on the Red River, was completed in 1943. It was authorized for flood control and hydroelectric power. Lake Texoma, its reservoir, covers 227 square miles and has one of the largest capacities in the United States. There are also recreational facilities and wildlife refuges.

In 1872 the resident of Red River City, desiring higher lands, chose the present site of Denison for their new home. Incorporated in 1873, it has commission form of government. It is the birthplace of Dwight D. Eisenhower. Pop. (1940) 15,581; (1950) 17,504.

DENISON UNIVERSITY, an educational institution in Granville, Ohio, founded in 1831 under the auspices of the Baptist Church. The manual training school, with which it opened, and its theological department were both abandoned in 1870. Shephardson College for Women is now part of the university. Courses lead to the A.B., B.S., and Ph.B. degrees. Its annual enrollment is approximately 1,300.

DENIZEN, in *English law*, an alien who

by royal letters patent has been granted the rights and privileges of British subjects. No denizen can sit in Parliament or take office.

DENIZLI, dē-nēz-lē', province, Turkey, is located in the southwestern section of the country. It has an area of 4,244 square miles and produces chromium, copper, sulphur, lignite, emery, grain, cotton, and raisins. The Mentese Mountains are in the southwest and the rivers of the province are the Ak, Dalaman, and Menderes. The capital is Denizli. Pop. (1950) 340,010.

DENIZLI, town, Turkey, in the province of Denizli; about 115 miles east-southeast of Izmir. In the 12th century during the wars between the Seljuks and the Byzantines, it replaced the nearby ancient town of LAODICEA or LAODICEA AD LYCUM which was founded by Antiochus II. Several times destroyed by earthquake or conquest and rebuilt, it is now in ruins. The modern town is connected with Izmir by railroad and is known for its beautiful gardens. Cotton goods, lignite, tobacco, sesame, and grain are produced. Pop. (1950) 22,029.

DENMAN, dēn'mān, Thomas, 1st Lord DENMAN, English judge: b. London, Feb. 23, 1779; d. Sept. 22, 1854. In 1820 he was solicitor general to Queen Caroline, whom he defended before the House of Lords. After becoming attorney general in 1830, he prosecuted reform rioters. From 1832 to 1850 he served as lord chief justice and in 1835 was speaker of the House of Lords. He condemned Edward Moxon, publisher of Percy Shelley's works, for blasphemy in 1841.

DENMARK (Dan. DANMARK, dān'märk), a kingdom of northern Europe, comprising Denmark proper and the colony of Greenland, q.v. (Grønland). Denmark proper consists of the Peninsula of Jutland (Jylland) and 483 islands, of which about 100 are inhabited. The most important of the islands east of Jutland are: Fyr (Funen, Fyen), Als (Alsen), Aersø (Arø), Taasinge, Langeland, Samsø (Samsoe), Zealand (Sjælland), Falster, Lolland (Laaland), Bogø, Møen, Amager, and Bornholm; to the west of Jutland are situated Fanø and Rømø; and the Faeroe, q.v. (Faroe, Faerø) Islands, lying in the North Atlantic, form a county of Denmark. On the west, Denmark is bounded by the North Sea (Vesterhavet); on the north by the Skagerrak, separating the country from Norway; on the east by the Øresund (Oeresund) and the Kattegat, between Denmark and Sweden; and on the south by the Baltic Sea. The boundary with Germany extends from Flensburg (Flensborg) Fjord in the east to a point midway between Højer and Klanxbuelt in the west. The total area of Jutland and the surrounding islands comprises about 16,576 square miles with a total population (1945) of 4,045,232. The Faeroe Islands cover 540 square miles; population (1945) 29,198. Copenhagen (København), the capital city, is situated on the island of Zealand; population with suburbs (1945) 927,404. The Danish coinage system is regulated by the law of May 23, 1873, when the gold base was introduced. The basic monetary unit is the krone (plural kroner), which is divided into 100 øre. In April 1948, one krone equaled approximately 20.86 cents in U.S. currency. The National Bank

of Denmark has the sole right of issuing notes and the gold basis must be 25 per cent of the notes issued. The obligation of gold redemption was temporarily suspended December 1931. The metric system of weights and measures was introduced May 4, 1907, the law becoming effective from April 1, 1916. The national flag of Denmark is *Danebrog*, q.v. (*Dannebrog*): a white cross on a red background. The national anthem is *Der er et yndigt Land* (*There is a Lovely Country*), and the hymn royal is *Kong Christian stod ved højen Mast* (*King Christian Stood by the High Mast*).

Detailed discussion of Denmark is given under the following headings:

The Land	Transportation and
Chief Cities and	Communication
Population	Financial Factors
The People	Government
Agriculture	Religion
Cooperatives	Education
Industrial Development	Architecture
Labor Relations	Handicraft
Trade	History
	Bibliography

The Land.—Denmark is a lowland; its highest point, Ejer Bavnehøj in Jutland, reaches 172 meters (564 feet). The average altitude for the whole country is about 30 meters (98 feet). With the exception of Bornholm, Denmark lies in the depression between Finnoscandia-Russia and the middle German-British mountain formations. On Bornholm's north coast, bottom rock is found, but in the remainder of Denmark the underground consists of various chalk formations, in certain places reaching above the surface as in Møns Klint. Over the chalk underground are found glacial deposits. The country's surface formations, as well as ground conditions, were formed during and after the ice periods. In general, these land formations are morainic hills, fields of glacial deposits, moors, hilly islands, ridges, raised sea bottom, and on the west coast, downs and marshes. In some parts of the country, especially in Jutland near Ribe and Tyborøn (Tybørøen), and on the southern coast of the island of Lolland, it has been necessary to protect the coast by means of dikes.

Denmark abounds with minor water courses, the longest of which is the Gudenaa River (150 kilometers or approximately 93 miles) in Jutland. Inland seas are numerous but small, the largest being Arresø in northern Zealand near Frederiksværk, and Mos Sø in Jutland. The coasts are richly incised with fjords and bays; the principal harbors are Copenhagen, Esbjerg, Aalborg, and Aarhus. Separating the large islands on the west from one another and from Jutland are the straits called the the Little Belt, the Great Belt, and its southern continuation, the Langeland's Belt, and finally the Øresund between Zealand and the southern tip of Sweden.

The climate of Denmark is temperate. During January and February the average temperature lies around the freezing point, and the warmest month, July, averages 15.5° to 17°C. Westerly winds are predominant and rainfall occurs throughout the year.

Denmark belongs to the middle European flora district. About 1,400 species of flowering plants are found, as well as 30 kinds of ferns and fungi, and around 450 mosses. The flora was formed after the glacial period. Various classes of vegetation comprise woods of beech and oak and the herbage of moors, ridges, sandy strand, meadows, and reed bogs.

Most of the wild animals of Denmark immigrated after the glacial periods. Mammals, comparatively scarce, include the hare, stag, fallow deer, roe, badger, fox, squirrel, marten, and wood mouse. There are about 340 species of birds, 190 breeding in Denmark, while the remainder are guests during the winter. Reptiles number 7 species; toads, 12; and fish, 170. Insect life is abundant.

The natural resources of the country are not of importance. The land is poor in minerals and only peat and lignite are found as fuels. Chalk, lime, and clay are utilized in the tile and cement industry.

Chief Cities and Population.—In respect to population, Denmark cannot be compared with the thickly populated industrial districts in other parts of Europe. Nevertheless, it is a relatively densely populated country. The average is about 94 persons per square kilometer (244 per square mile). Of the total population in 1945 (4,045,232), about 65 per cent lived in towns. This figure, however, includes not only the population of Copenhagen and its suburbs, Frederiksberg and Gentofte, and the towns which, in an administrative sense, have municipal government, but also the population of suburban districts and other urban localities in the rural areas. The population of Copenhagen, numbering 927,404 in 1945, comprised about 23 per cent of the total population. The great majority of provincial towns are very small. The following table lists the provincial towns with more than 10,000 inhabitants in 1945:

<i>In Zealand:</i>		<i>In East Jutland:</i>	
Roskilde ¹	23,497	Aarhus	107,393
Helsingør (Elsinore) ²	18,930	Randers	36,434
Slagelse	18,073	Horsens	32,400
Næstved	15,104	Kolding	27,660
Holbæk	13,467	Vejle	27,107
Korsør ³	10,667	Fredericia	22,963
		Silkeborg ¹	20,955
<i>In Lolland:</i>		<i>In West Jutland:</i>	
Nakskov ²	15,506	Esbjerg ²	43,241
		Viborg ¹	20,084
<i>In Falster:</i>		Herning ¹	16,285
Nykøbing	16,097	Holstebro ¹	13,212
		Skive ¹	12,369
<i>In Fyn:</i>		<i>In South Jutland:</i>	
Odense ²	92,436	Haderslev	17,583
Svendborg ²	21,356	Sønderborg	14,125
<i>In North Jutland:</i>		Aabenraa	12,189
Aalborg ²	60,880		
Frederikshavn ²	16,827	<i>In Bornholm:</i>	
Hjørring	13,346	Rønne	11,497

¹ Not harbor towns. All other towns are situated on the coast and have a harbor.

² Important centers for high sea fishing.

³ Shipbuilding centers. Copenhagen also has several important shipyards.

The People.—The Danish nation constitutes the southernmost branch of the Northern Germanic or Scandinavian group of nations. The language is closely related to Swedish and Norwegian, but Danish has departed furthest from the common ancient Nordic tongue of the pre-Viking and Viking period. Icelandic and the dialect spoken on the Faeroe Islands, and the now extinct native dialects on the Orkneys and Shetlands, are those nearest to the original.

Modern Danish has a strong admixture of German words, partly because the Bible in the Reformation period was translated into Danish from German, and partly as a result of the constant influx of artisans from northern Germany. In modern times there has also been an admixture of English and American.

One might cite Denmark as an illustration of the dictum by Taine, the French philosopher,

that national characters are shaped by geography. The fundamental types of the Danish national character are conditioned by the fertile lowlands surrounded by water. The farmer, the sailor, and the merchant are thus prototypes. In history, Danes have never distinguished themselves as soldiers, but Denmark's fleet has been one of the chief navies in Europe, second only to the Dutch or the British fleets. The Vikings showed the innate prowess of the Danes for the sea. The narrowness of the Danish islands has made good husbandry a precondition of national existence.

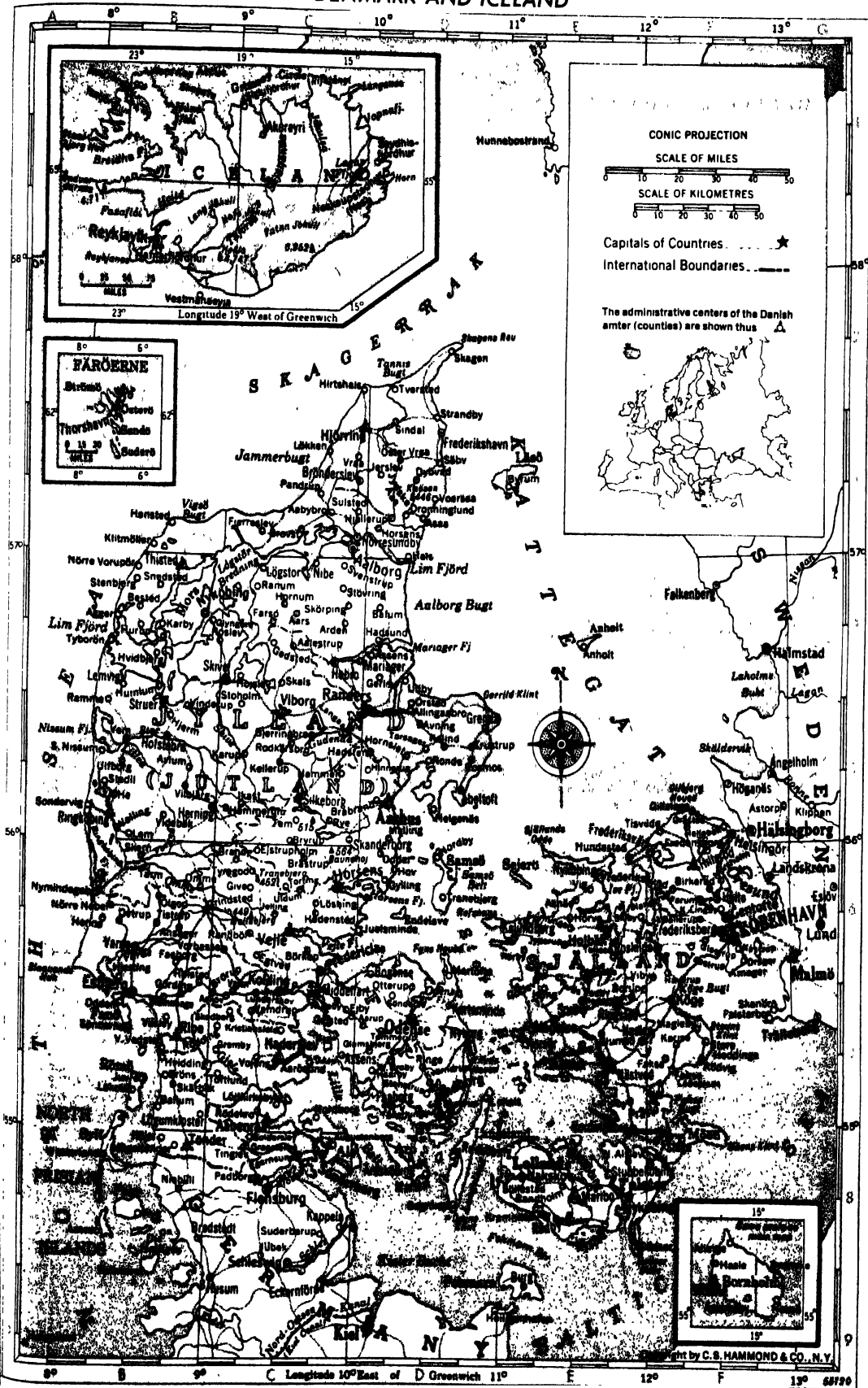
Agriculture.—Despite not having especially fertile soil or advantageous climate, Danish agriculture is highly developed. Of the country's total area, 75 per cent is cultivated, and 30 per cent of the population is engaged in farming. Forty per cent of the farming area is laid out for grain crops, 15 per cent for turnips, and 40 per cent for grazing. The most important crops are barley, oats, rye, some wheat, potatoes, fodder turnips, and sugar beets. Production is abundant owing to improved agricultural methods which have been considerably promoted by government aid. Major parts of this improvement consist of drainage work. Fruit growing has made enormous advances in Denmark. Many farms have been turned into fruit plantations, and an export trade has developed, chief markets being the other Scandinavian countries. The most important product comprises several varieties of apples; pears also are grown extensively.

Cattle and poultry raising rank most important in agriculture. The number of horned cattle, horses, swine, and poultry before World War II was so great that the import of feed-stuffs was very considerable. But the isolation of Denmark from overseas markets during the occupation period caused a decline in animal stock. The chief products are milk, butter, bacon, eggs, pork, and meat, great quantities of which are shipped abroad in exchange for important goods. This accounts for Denmark's numerous dairies and slaughterhouses, the greater part of which are based on the cooperative system.

About 200,000 landed properties exist in Denmark: 2,000 are estates comprising 8 per cent of the acreage; 90,000, farms; and 110,000, landed cottages. Since the beginning of the century the number of small holdings has increased considerably as a result of the law of 1899, since then frequently amended, which provides for the establishment of small holdings. Through cheap and abundant financial support the state enables persons of small means to become independent farmers. The state small holdings are set up according to two different principles. Under the original legislation, which remains to some extent operative side by side with the more recent regulations, the small holder owns both the land and the buildings, state aid being exclusively in the form of loans. Under the more recent legislation of 1919, the small holder possesses only the farm buildings, while the land remains the property of the state, the small holder paying an annual rent fixed according to the official assessment value. The state grants loans for the erection of buildings on the lines of the older legislation.

Forests are scarce in Denmark—about 10 per cent of the area—and only 1.25 per cent of the

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working population is engaged in the forestry industry.

Fishing plays an important role in Danish economy, there being approximately 7,500 cutters, 3,000 of which constitute the high fishing fleet. Fishermen number between 15,000 and 20,000. The value of the catch in 1948 approximated 170 million kroner, 90 per cent of which was exported. Part of the catch was sent directly to Great Britain; part frozen and transported in trucks to Belgium, western Germany, France, and Italy. People in towns like Frederikshavn, Tyborøn at the western end of the Limfjord, and especially Esbjerg live almost exclusively by this industry. The normal Danish high-sea cutter is a vessel of 15 to 50 gross registered tons, able to withstand even violent storms at sea. The principal fishing banks are the Dogger Banks in the North Sea and other parts of this sea, the western part of the North Atlantic, and even the waters east of Greenland. The chief catches are plaice, cod, herring, and herring shark; the latter are exported to Italy.

Government loans help support the fishing industry. These are granted primarily for the purchase of cutters, because the government wishes to avoid the emergence of a few large companies owning a major part of the fleet.

Cooperatives.—*Consumers' Cooperatives (Brugsforeningerne).*—The first cooperative store was founded in 1866 by a parson named Sonne, in Thisted. In 1948 the movement consisted of 1,945 local unions (stores) with 434,000 members. If one reckons each member as the representative of a family of four, about 40 per cent of the Danish population trade in cooperative stores. Total turnover in 1947 amounted to approximately 500 million kroner, or 10 per cent of the total retail turnover. The central office of the cooperative movement (Facilforeningen for Danmarks Brugsforeninger) had in the same year a turnover of 260 million kroner, and the factories added a turnover of 110 million kroner. Actually, the cooperative stores have the lion's share of the retail trade in the farming districts.

Producers' Cooperatives (Andelsbevaegelsen).—The first cooperative dairies were founded during the agricultural crisis of the 1880's, when cheap grain from overseas countries upset the European market. Most countries then introduced protective tariffs but Denmark found another way out. Dairy farming on the Dutch model had long been the custom on the large estates. This was now taken up by the ordinary farmers, while pig farming, up to then the prerogative of the cottagers, was adopted by large and small estates. The pigs were fed partly with the skimmed milk returned by the dairies. This type of production is still the rule in Denmark.

After cooperative dairies, cooperative slaughterhouses were built. Following these, cooperative sales organizations and cooperative finance institutions as well as cooperative purchasing agencies were formed.

In 1947, this imposing system consisted of 1,367 dairies; 61 cooperative slaughterhouses; 4 cooperative slaughterhouses for poultry; 1 cooperative portland cement factory; 10 cooperative butter export agencies; 1 cooperative egg export agency; several cattle export agencies; and several cooperative agencies supplying coal, fer-

tilizers, and seed to the members. Following World War II, numerous cooperative tractor and machinery stations developed. About 80 per cent of the export of agricultural products is handled by the cooperatives.

The financing of the entire cooperative movement, consumers' as well as producers' cooperatives, is handled by the cooperative bank, which has grown into one of the major banks of the country (Andelsbanken).

The financing of agriculture itself is carried on by a number of societies, which issue bonds to be sold on the general market. The system works thus: A number of farms, housing properties in the towns, and factories are joined into one "series," the individual properties being mutually liable for the whole bond issue in the series. The advantage of the Danish system is the limited risk and consequently diminished disagio of the bonds; the disadvantage, a progressing indebtedness of agriculture. Total issue of bonds in 1945 amounted to 6,129,500,000 kroner, of which one third had been issued by one institution alone, the Østifternes Kreditforening.

It has developed that the financing through bonds of agriculture is less important than the financing of housing and of the building of industrial properties. These bonds are in favor with the modest investor, as well as insurance companies, savings banks, and public trusts.

Industrial Development.—Industry and handicraft (firms employing five workers or more) depend upon Denmark's importation of coal, oil, and practically all raw materials; also partly manufactured goods imported for conversion into finished goods. The principal industrial classifications are as follows: cooperative dairies and cooperative slaughterhouses (in both instances about 80 per cent of the total production being handled by the cooperatives); canning factories; textiles; vegetable oils; chinaware; portland cement; shipyards; iron and steel, engineering, and electrotechnical works. Cement is a Danish product with a market throughout the world, and Danish porcelain, by virtue of its high artistic standard and technical quality, is perhaps the best known Danish export commodity after dairy products. Other important exports are fine silverware, Diesel engines, ships, cement plant machinery, refrigerating plants, dairy machines, and certain chemical articles, such as cheese, rennet, and insulin.

A number of public utilities, such as railways, streetcars, gas and electrical works, are operated by the state and municipalities.

Labor Relations.—The trade union movement is very strong in Denmark. In 1947, there were 3,734 unions with 339,640 members, of which number only 242 unions with 25,712 members are not affiliated with the Samvirkende Fagforeninger (Cooperating Unions), a central organization established in 1898 at the occasion of an important labor dispute. Employers are organized under the Dansk Arbejdsgiver-Forening (Danish Employers Association), numbering about 20,000 firms. Collective agreements are the usual procedure, but in case of legal disputes the parts submit to a court of arbitration erected in 1908. In case of labor conflicts, the state may interfere through a conciliatory board consisting of three members, who will submit an arbitration proposal and call for a vote from the organizations in question. In the years 1930 to 1940,

such proposals were repeatedly proclaimed as laws to avoid labor conflicts, dangerous to society. During the German occupation, strikes and lockouts were prohibited, but this provision was suspended in 1945.

Trade.—Under normal conditions Denmark's foreign trade is of considerable importance. The chief exports are bacon, butter, eggs, cattle, and fish; ships and motorcars; cement, dairy, and refrigerating machinery; and vegetable oils. Goods of agricultural origin account for 75 per cent of the exports.

Normally, imports consist principally of feed-stuffs and fertilizers for agriculture, raw materials for industry (50 per cent), and various manufactured goods, such as textiles, automobiles, rubber goods, and leatherware.

Before World War II the foreign trade of Denmark was extensively with England and Germany; with Sweden and the United States to a lesser degree. After the war, Britain again became the main market, with Belgium, Switzerland, and the U.S. Army in Germany as important secondary customers.

Transportation and Communication.—The Danish commercial fleet consisted on May 5, 1945 of approximately 625,000 gross registered tons, as against 1,093,000 gross registered tons on Jan. 1, 1939. Total war losses amounted to 533,000 gross registered tons, or about one half of the prewar fleet, but a number of ships were added to the fleet during the war. By Jan. 1, 1949, the fleet totaled approximately 1,050,000 gross registered tons. Nearly half of the shipping between Denmark and other countries before World War II was carried in Danish bottoms, and half of the freight profits originated from foreign trade. Communications between the many Danish islands are maintained either by ship and ferry, or over the numerous bridges. The most imposing of these are the Little Belt Bridge, 800 meters long, between Jutland and Fyn, opened in 1935, and the Storstrøm Bridge, 3,200 meters long, between Zealand and Falster, opened in 1937.

Nearly half the country's railway network, principally the main lines, are owned by the state, which also, jointly with the townships, is a shareholder in the private railways. Three cities have electric tramways—Copenhagen, Aarhus, and Odense—but developments tend toward motor-buses.

Denmark has several airports, the largest being Kastrup near Copenhagen and Aalborg. Air traffic is handled by Det danske Luftfartsselskab (Danish Air Lines) in conjunction with the Scandinavian Airlines System.

The postal system is solely under state management. Mail is delivered daily to every farm or house throughout the country.

The Danish press is free. The most important Copenhagen newspapers are: *Berlingske Tidende*, conservative; *Politiken*, radical; *Social-Demokraten*, Socialist; *Nationaltidende*, conservative; *København*, liberal agrarian; *Land og Folk*, Communist; *Information*, independent, formerly resistance movement. Outside Copenhagen, there are numerous papers which are politically influential. The political parties have established numerous local papers, many of which are cooperating in chains.

The broadcasting system belongs to the state and is governed by a Radio Committee, consisting of government appointees and elected mem-

bers. The expenses are paid by the listeners' licenses.

Financial Factors.—Danish banking is characterized by a marked concentration; the greater part of the banking business of the country being in the hands of three large, and five medium-sized banks; all three of the former and two of the latter banks have their headquarters in Copenhagen. More than one half of the total of the balance sheets of all the banks is represented by the three large banks. Nevertheless, the number of independent banks all over the country is very large, though with some few exceptions they are of local importance only, and in some cases of no great size.

Danmarks Nationalbank is the only bank of issue in Denmark. It was established in 1813. Its activities are governed by the act of April 7, 1936, which converted it from an independent corporation into a state-controlled institution, although the bank on the strength of tradition has kept a certain autonomy.

The number of savings banks in 1945 was 511, with a total deposit capital of about 4,000 million kroner. The savings banks are all private undertakings, there having been no demand for a post office savings bank in Denmark. The savings banks adhere to the principle of a conservative financial policy. Since 1880 the savings banks have been under the supervision of a savings bank inspector.

Government. The form of government is now based on the constitution of June 5, 1915, which confirms Denmark as a constitutional monarchy. Legislative powers are vested with the king and the Parliament (*Rigsdag*), executive authority rests with the king and government, and the administration of justice with the courts. The crown is hereditary in the royal house of Glücksborg, which ascended the throne in 1863. Without the consent of the *Rigsdag*, the king may not declare war, conclude peace, or sign treaties. He must belong to the Lutheran Church and before he takes government, promise to respect the constitution. He enjoys personal integrity and is not responsible for acts of government; the ministry assumes that responsibility. All government stipulations must therefore be countersigned by one or more ministers. According to the constitution, the king is free to select his ministers, but since 1901 it has been the practice that these be chosen from members of the political party, or coalition of such, that commands a majority in the Folketing. The parliamentary principle is thus not established by constitutional law, but by a tradition resulting from a drawn-out political battle between the Parliament and the crown in the closing decades of the 19th century. The only stipulations, on which the power of Parliament rests, are: (1) Parliament is to be convoked at least once a year, not later than the second Tuesday in the month of October. (2) No revenue may be collected, and no expenditure made, without express approval by Parliament.

The royal Cabinet consists of a premier and 10-15 ministers, who, together with the king, constitute the state council.

Two houses form the *Rigsdag*: the Folketing (lower house) and the Landsting (upper house). The Folketing has 149 members, elected through direct franchise by both men and women. The voters must be 25 years of age, and be constant inhabitants and citizens of Denmark. The fran-



DENMARK

Top The Danes cherish their folk culture—a dance.

Above left In Copenhagen, where there are more bicycles than cars, a fence solves the parking problem.

Right These Faeroe Island fishermen speak a language of their own akin to Icelandic.

Bottom left Harbor at Thorshavn, seat of government in the Faeroe Islands.

Bottom right The town of Ribe in southern Jutland has changed little since the Middle Ages.

(Top) Danish Information Office; (above left) Burton Holmes from Ewing Galloway; (right and bottom left) Ewing Galloway, N.Y., (bottom right) Herbert Lanks from Black Star





Klages Moosbrugge from Black Star

Above: Canal in Copenhagen. Below left: Legendary hero Holgerdanske at Marienlyst, near Helsingør (Elsinore). Below right: "Little Mermaid," statue suggested by Hans Christian Andersen's story, rises from the harbor at Copenhagen.

Ewing Galloway

Black Star



chise is exercised as proportional election so that 117 representatives are chosen in 117 election districts, while 31 mandates are distributed in such manner that each political party obtains a representation corresponding to the number of votes scored by their politics. The Folketing is elected for 4 years, but at any time it may be dissolved. All voters are elective.

Franchise and electivity to the Landsting are possessed by all qualified voters to the Folketing over 35 years of age. The house consists of 76 members, 19 chosen by the old Landsting itself at its last sitting, while the rest are selected through indirect return, so that half of the members retire every 4 years. The house-elected delegates retire simultaneously after 8 years of service. Both houses are on equal footing and all legal acts must be carried in both houses without verbal differences. Finance bills, however, must first be submitted to the Folketing. Actually, political power is exercised by the Folketing, or lower house.

Jurisdiction is exercised by the Supreme Court, the regional courts of justice, and the local courts. The justices can only be relegated through sentence and may not be removed against their wish. The constitutional law does not contain any stipulation that the courts may suspend a law adverse to the constitution. The Supreme Court is made up of a president and 12 judges and is the highest instance of appeal. There are two regional courts. In civil suits, the seats are held by 3 judges; in criminal cases, by a panel of 12 jurymen or by 3 justices. Sentences passed by the local courts may be appealed to the regional courts, while appeals to the Supreme Court will be granted only by permission of the minister of justice. There are 92 local courts, where in criminal cases the chair is held by a judge assisted by two lay justices. A minister of the crown may be impeached for his conduct of office. A court of impeachment will in that case be specially constituted, consisting of the Supreme Court and 13 members of the Landsting, or upper house.

The Ministry of Foreign Affairs attends to Denmark's foreign relations. Denmark has diplomatic relations with most countries abroad. After World War II, the Danish ministers in the United States, Great Britain, France, the Soviet Union, Norway, and Sweden were raised to the rank of ambassadors. The Rigsdag through its Foreign Relations Committee controls the conduct of foreign policy. The Rigsdag, and not the government, has the final word in these matters.

Local Government.—Ever since the revolution of 1660, Denmark has been a centralized country, but having extensive self-government in local matters. The 22 prefectures (*amter*), each headed by a governor (*amtmand*), into which Denmark is divided, are administrative entities. Three of these *amter* are furthermore subdivided, making a total of 25, while the Faeroe Islands in the North Atlantic constitute an independent prefecture or *amt*. (After World War II, the Faeroes achieved a privileged position with home rule, and now constitute a kind of dominion under the Danish crown.)

Each prefecture has a county council, each parish a parish council, and each town a municipal council, all elected. The governor is the local representative of the central administration. These councils are elected by all tax-paying citi-

zens, regardless of sex, above 25 years of age. The term of the councillor is four years.

The town council, headed by a mayor or burgomaster, levies local taxes and administers the local public utilities and other municipal tasks, such as schools and social affairs, under the control of the Ministry of the Interior.

The city of Copenhagen is autonomous. The municipal assembly of 55 members appoints a lord mayor (*overborgmester*), 5 mayors, and 5 aldermen. As representative of the state, a governor (*overpræsident*) is appointed by the king.

In each of the 1,300 Danish parishes, a parish council is elected as in the townships. These are under close control of the prefectures, and their decisions may be canceled if they are found contrary to law.

Defense.—According to the constitution (par. 88), every able-bodied man is liable to military service, it being prohibited to send a substitute (as was customary formerly). Before World War II, only part of the young men were actually conscripted, as the army and navy, through repeated saving measures, had been reduced in size. During the occupation, the Germans confiscated all material, arms, ammunition, and uniforms. This fact, combined with the tactical and strategic experiences of the war, necessitates a new postwar military organization for the three services—army, navy and air force.

Social Legislation.—Effective social legislation began in Denmark during the 1890's: state support for invalids and introduction of old age pensions. This legislation later branched out into other fields, until in 1933 it was codified in four great social reform laws. One is the regulation of popular insurance, based upon the sickness insurance. Every person, having reached majority and realizing an income equivalent to that of a skilled worker, has the right to be a member of a state-supported sickness benefit society, which for a modest premium will supply medical assistance, hospitalization, and medicines in cases of illness or childbirth. Persons with incomes above the stipulated limit can provide a private sickness insurance for themselves, but they must be passive members in a (state-supported) sickness association, thus retaining their rights in case their incomes drop below the limit. Membership in such associations entitles one to a pension in case of invalidity, and to old age pensions. This last may be obtained after the completed 65th year and is varied according to the person's own economic position.

A second law deals with unemployment insurance, which is administered by each labor organization's treasury. The resources for this purpose come in partly through the workingmen's own contributions, partly through payments by the state and communities.

A third law is the accident insurance enactment, and a fourth is the legislation on public welfare. The latter provides for the possibility of public assistance in cases where such is needed, but is not provided for by the other three regulations.

Religion.—The constitution provides for religious freedom in Denmark, while the public creed is that of the Lutheran Church which is supported by the state. Many divergent religious beliefs also exist: Jews, Roman Catholics, Methodists, and Reformed Protestants. The head of the official church is the Danish king.

The country is divided into nine bishoprics. There are 2,000 parishes and about 1,300 pastors. In each congregation a chosen parish council supervises the church and chooses the minister. Also the bishops are elected to their service.

Education.—In the Middle Ages, education was entrusted to the church. Several schools in provincial towns are still called cathedral schools, because they can be traced back to some medieval establishment connected with a bishopric. One of the two famous private schools in Denmark, Sorø Akademi (Soroe Academi), dates back to a monastery founded by the illustrious family of the Hvide. The other, Herlufsholm, was founded soon after the Reformation by the rich nobleman, Herluf Trolle, and his wife, Birgitte Gøje. Apart from the accidental instruction given by village deans, public instruction began in the 1720's, when King Frederick IV diverted part of the estates, which hitherto had supported the cavalry of the realm, to the support of a comprehensive schooling system. Part of these "cavalry schools" (*Rytterskoler*) still exist.

The law of 1814 made schooling compulsory, but on paper only. It took a long time before the necessary schools were built.

The present Danish education system consists of a compulsory ground school for children aged 7 to 10. At this age the children can either pass an examination and be admitted to the high school (*mellemskole*), or continue in the practical high school (*praktiske mellemskole*), which does not give any final examination or degree, but leads on to a technical, vocational training, suited for apprentices in industry or handicraft. Pupils in the ordinary high school are at the age of 14 submitted to a new examination, which, if the necessary number of points are obtained, gives admission to either a commercial training school, a one-year course called *real-lassen*, with special emphasis on modern languages and arithmetic, or finally to a three-year Gymnasium, which ends with a B.A. degree, giving admission to the universities, technical colleges, schools of dentistry, and similar institutions. Students at the university enjoy a far greater degree of liberty than American college students; it is considered their private affair, when and how they conclude their studies. No tuition fees are demanded by the universities, their expenditure being met partly by the income from their property, mostly medieval endowments, and partly by the state treasury.

A feature peculiar to Danish adult education is the Danish Folk High School (People's College). Originating from the conceptions of Bishop N. F. S. Grundtvig, poet, historian, and educationist, the first school was established in 1844, and in a short time a great number came into existence. Most of their students are drawn from the rural population, but the schools are open to all; 10 to 15 per cent of the students come from the towns. Instruction is given in ordinary school subjects, but the main emphasis is laid on national literature, history, and the social sciences (economics and civics) in order to awaken and strengthen the interest of the students in problems of life and society. In some of the schools, farming subjects, house-keeping, and gymnastics are taught. The schools generally have a five months' winter course for young men and a three months' summer course for young women. Fees for instruction, board,

and lodging are 110 to 120 kroner a month; students may obtain scholarships from the government. Together with agricultural schools, these institutions have been of great cultural importance to the young people of the country and have contributed to their economic advancement through improved farming methods, and in particular the cooperative movement. In 1944 there were 54 Folk High Schools with 6,100 students, distributed throughout the country, three being in Copenhagen.

There are two universities in Denmark: the University of Copenhagen established in 1479, and the University of Aarhus, founded in 1928 and opened in 1933. In Copenhagen there are also various academics and colleges: Polytekniske Laereanstalt (technical sciences); Landbohøjskolen (agriculture); Tandlaegehøjskolen (dentistry); and Handelshøjskolen (commercial studies).

The most important libraries in Copenhagen are the Kongelige Bibliotek (Royal Library) and the Universitetsbiblioteket (University Library). The State Library is located in Aarhus. A great number of public libraries are found in various cities and parishes. (See also LIBRARIES.)

The most renowned museums are National musæet, Rosenborg, and the Kunstmusæet (Arts)—all located in Copenhagen—and Frederiksborg Slots Musæum, situated in the town of Hillerød, north Zealand.

Architecture.—All European styles are represented in Denmark, but the Danish rendering is subdued and sober, keeping only the essentials. This is apparent even in the one specimen of Byzantine architecture in Denmark, the five-towered church of Kalundborg, which probably was designed by some returned Viking. The Gothic style is represented chiefly by the typical village church, the gabled towers of which are a peculiar trait of the countryside. The main building material is brick, red or yellow, which imposes limitations on design. This general sobriety is apparent even in the midst of all the extravagancies of detail in the numerous buildings from the Renaissance period. Frederick II (1559–1588) and Christian IV (1588–1648) dotted Denmark with their castles (Elsinore and Frederiksborg north of Copenhagen, Rosenborg and the Stock Exchange in Copenhagen). The primary influence in this period was exerted by the Dutch.

The voluptuousness of the German baroque is absent from Denmark. The main building from this period, Our Saviour's Church in Copenhagen (Vor Frelserkirke) employs the elements of this style for the opposite purpose. Its steep, corkscrew-shaped tower nearly pierces the heavens.

The castles of the 18th century are built in the sober, Palladian style (Fredensborg, Frederiksborg, Charlottenborg, as well as the numerous palaces of noblemen or rich burghers around the present royal castle of Amalienborg, which are one of the main attractions of Copenhagen).

Modern architecture shows the same characteristics. Beauty effects are sought through the proportion and general outline of the building, but modern structures may display quite daring designs which reflect those same strange, innate fancies which found expression in the fantastic details and green copper roofs of the ancient buildings.

A large proportion of dwelling houses in Denmark were built in the 20th century and have the essential modern conveniences.

Handicraft.—The high standard of Danish handicraft is a compliment to the emphasis placed by the authorities on the necessity of giving the youth a thorough training in this art. The two main branches are silverware and chinaware, which both have a long history.

Modern development in the silver trade began with Georg Jensen, (born 1866), who introduced bold, strong shapes and profiles instead of the pretty and pretentious filigree work prevalent in the last decades of the 19th century. Jensen's innovations were adapted by other workshops, and have been developed into a kind of national style.

The Royal Porcelaine Manufacture has also developed its peculiar style. Its blueish tints on white vases, etc. is famous. While keeping all old patterns, the factory employs a host of modern artists, who have developed many individual designs and daring new colors.

In the wake of these important firms there is a host of small workshops, each with a characteristic material and type of design, constituting together an important industry.

See also separate articles on DANISH LANGUAGE; DANISH LITERATURE; DANISH MUSIC

HISTORY

At the beginning of history Denmark's population was composed of free peasants living in hamlets, and of chieftains who until about 1200 A.D. tilled their soil by means of serf labor. The hamlets were assembled in "hundreds" (townships) with cantonal courts where disputes were dealt with, and in districts—Skaane (Scania, Skåne), Zealand (Sjælland), and Jutland (Jylland)—where by a Landsting the mutual laws were adopted and the kings chosen. Gudfred (Godfred) is mentioned in the year 810 A.D. as the first king. About 826, Christianity came to Denmark through the Frankish missionary Ansgar (Ansgar, 801–865), who became the first archbishop of the north. Under Gorm the Old (r. 883?–940), Denmark became one kingdom and since then has never been subdivided. The son of Gorm, Harold Bluetooth (Harald Blaatand, r. 940?–985), accepted Christianity, thereby establishing the new religion in Denmark. In his reign the Danewerk, q.v. (Dannevirke), a stone and brick wall meant as a defense against the Saxons, was built across Schleswig (Slesvig).

The Viking Period.—The first recorded Viking raid was made on England in 787, following which hosts of warriors ravaged the coasts of western Europe. In 878, the Danes established their rule over that part of England called Danelagh, q.v. (Danelagen), and early in the 10th century they acquired the duchy of Normandy (q.v.) in northern France. Under Sweyn I, or Sweyn Forkbeard (Svend Tveskaeg, r. 985?–1014), the Viking raids culminated with the subduing of all England (1013) which then had Danish kings until 1042. Sweyn's son, Canute II, the Great, became king of England in 1016, of Denmark in 1018, and of Norway in 1028. After the death of the latter's son, Hardecanute (Harthacnut) in 1042, Denmark and England were separated. From 1042 to 1047, Magnus I, the Good (who had become king of Norway in 1035) ruled over both Denmark and

Norway. After his death, Denmark and Norway were again separated.

Consolidation of the Kingdom.—Under Sweyn II, or Sweyn Estrithson (Svend Estrids-son, r. 1047–?1075), the Christian church was organized with bishops. The first archbishopric was established at Lund in 1104. Sweyn was succeeded by five sons, and when the last died (1134), civil war followed, lasting until 1157 when Waldemar I, the Great (Valdemar, r. 1157–1182) ascended the throne on the initiative of the powerful kingmaker family of the Hvide. His chancellor, Absalon, archbishop of Lund belonged to this family. Absalon founded the present capital, Copenhagen, as a coastal fort. The reigns of Waldemar and his successors marked the first period of grandeur in Danish history. Internally a powerful kingdom was consolidated, the first cities were founded, and numerous churches were built. Most forests were cleared in this period, whereby agriculture was given a much broader basis. Through successful wars, Danish dominion was extended to large districts of northern Germany around the Baltic. But under Waldemar's second son, Waldemar II, the Victorious (Valdemar Sejr, r. 1202–1241), the Danish power in north Germany collapsed. In this period the medieval parliamentary organization of Denmark took form.

The centuries from 1241 to 1660 were characterized by fights between royalty, nobility, and the church. This began with a dispute between the king and the clergy, when the latter wished to introduce canonic jurisdiction into Denmark. Under Eric V (Klippling, r. 1259–1286), the nobility forced the king to sign (1282) a royal capitulation (*Haandfæstning*) stipulating certain limits to the royal powers. The position of the Danish nobility was further strengthened when the choice of a king was conditioned by his signing such a charter.

Following 1241, a state of interior warfare also existed. In 1252, Schleswig obtained its own duke and consequently steady wars took place between the Danish king and this ducal line, which was supported by the counts in German Holstein (Holsten). In addition, there were constant disagreements between the king and the archbishop, while the king tried to re-establish the former Danish power in north Germany. This brought the royal finances into confusion. When Christopher II died in 1332, almost the entire country was mortgaged. During the following eight years Denmark had no king (interregnum), but in 1340 the most dangerous creditor, Count Gerhard (Gert) of Holstein, was killed and Waldemar IV Atterdag (Other Day) was made king (r. 1340–1375). His surname refers to his favorite saying: "Tomorrow we have another day," illustrating his tenacity. He succeeded in reuniting the entire country and in conquering Gotland (Gottland) in the Baltic (1361). This island was the chief center of the German Hansa, a confederation of 70 to 80 cities, which had supported the counts of Holstein in their attempt to dismember Denmark (See HANSEATIC LEAGUE.) The subsequent war against the Hansa, and the union of the three Scandinavian kingdoms were thus only further developments in a long drawn-out struggle between the Germans and the northern peoples. Waldemar was followed in 1376 by his grandson Olaf (Oluf) II, who in 1380, as Olaf V, inherited Norway,

which country remained united with Denmark until 1814. After the death of Olaf in 1387, his mother Margaret (Margrethe or Margrete), who had ruled as regent, was elected queen of Denmark, and from 1388 also of Sweden. In 1397 it was attempted to make this union of the three Nordic kingdoms permanent (Union of Kalmar), but under the successors of Margaret (d. 1412), constant wars took place between Denmark-Norway and Sweden regarding this question. At the same time, Denmark was involved in wars for the possession of Schleswig, and with the German Hansa over trade in Scandinavia. From 1448-1481, Christian I held the throne, and with him commenced the house of Oldenburg which reigned in Denmark until 1863. With his ascension, the duchy of Holstein was annexed to the Danish crown.

Territorial Wars.—These various strifes concerning Denmark's hegemony in Scandinavia culminated under Christian II (r. 1513-1523), and after the "Stockholm Blood Bath" in 1520, Sweden renounced the union with Denmark-Norway. During a civil war—the Counts' Feud, 1534-1536—the conflict with the Hansa town was decided to the advantage of Denmark. At the same time, Protestantism was established in the kingdom. Under Frederick (Frederik) II (r. 1559-1588), Christian IV (r. 1588-1648), and Frederick III (r. 1648-1670), the fights with Sweden were continued to the increasing disadvantage of Denmark, resulting in Denmark's final loss of her old provinces east of the straits of Øresund—Skaane, Halland, and Blekinge.

This development caused in 1660 a change in the Danish Constitution: The nobility lost its predominant position and the king became an absolute monarch, this form of government lasting until 1848. Absolutism meant that power was exercised by a bourgeois civil service. The revolution did not lead to a parliamentary system, because the previous assemblies (Rigsraad) had been dominated by the nobility. The decisive event marking the change in power, was the successful defense of Copenhagen against a Swedish army (1658-1659) by the burghers of the town and the king.

Under the successors of Frederick III—Christian V (r. 1670-1699), and Frederick IV (r. 1699-1730)—repeated attempts were made to reconquer the provinces lost to Sweden, but after the Great Northern War all hopes were abolished (1720). The Danish king succeeded, however, in obtaining autocracy over the duchy of Schleswig.

Economic and Social Reforms.—After 1720 a long period of peace obtained, with realization of many important reforms; but the position of the peasantry became wretched. In 1733, the *Stavnsbaand* was introduced, which bound peasants to the estate where they had been born. The higher price of grain after 1750 and the developing commerce of Denmark owing to its neutrality policies during the great European wars, caused an alteration in the position of the government toward the peasant question. Under the reign of the mentally diseased Christian VII (1766-1808), the German physician, Count Johann Friedrich von Struensee, came into power for a short time (1770-1772) and carried through a series of reforms in the spirit of enlightened autocracy. Not until after his downfall was the peasant problem solved through the abolishment of the *Stavnsbaand* in 1788, ef-

fective from 1800, and an additional number of social and economic reforms took place during the following years. Thus the position of Danish peasants in modern times was founded.

Under the leadership of Count Johann Hartwig Ernst Bernstorff, foreign minister from 1751 to 1770 and again in 1772, Denmark conducted a happy foreign policy, resulting in the expansion of Danish commerce. The demands for free trade brought a Danish-Russian-Prussian neutrality alliance into existence in 1800 (see ARMED NEUTRALITY), which, however, resulted in an English attack on Copenhagen in 1801. Denmark was compelled to renounce the alliance, but in 1807, when Napoleon enforced his continental blockade and tried to draw Denmark into it, England struck her blow, resulting in Denmark's participation in the Napoleonic wars (1807-1814). By the Peace of Kiel (1814), Denmark had to cede Norway to Sweden and in exchange received (1815) the duchy of Lauenburg, which, similar to Holstein, was a member of the German federation. During the war, the Danish financial system and foreign trade had been ruined, and in 1813 the state had to declare its bankruptcy. King Frederick VI ascended the throne in 1808, after many years of rule as crown prince.

Growth of Liberalism and Nationalism.—In the years between 1814 and 1830, developments were characterized by the poor economic situation, and the consequences of the state bankruptcy in 1813 were aggravated by an agricultural crisis that set in after 1818. From about 1830, however, a period of economic recovery was experienced, at the same time that two political movements came into existence: liberalism, which aimed at a free constitution; and nationalism, which fought for the separation of Danish Schleswig from German Holstein and Lauenburg, and the duchy's closer union with the Danish kingdom. The Schleswig-Holstein politicians, however, desired a closer interdependence between the two duchies and also Schleswig's membership in the German state federation. (See SCHLESWIG-HOLSTEIN.)

After the French July Revolution of 1830, political liberalism in Denmark grew powerful and was principally supported by the academicians and city inhabitants. Consultative diets were erected (1834) in all parts of the country, and these caused a vivid interest in politics. A political press came into existence, and among the peasantry a special peasant movement sprang up, demanding a further development of the rural reforms of the 18th century.

The clash between Danish and German factions within the Schleswig-Holstein diets developed into a national struggle. Through several centuries, Danish Schleswig had been Germanized, but now there occurred a national awakening which demanded the Danish character of this province emphasized in schools, church, and administration. This movement and political liberalism were eventually united into national liberalism that received support from the pan-Scandinavian movement. Under Christian VIII (r. 1839-1848), national liberalism came into full flower, and the king acquiesced with a series of liberal reforms within the administration but refused discussion regarding a free constitution for the Danish monarchy. In the national question he showed a wavering course, desiring to retain the unity of the state

DENMARK



Above: Bird's-eye view of Copenhagen, Denmark's capital. A narrow arm of the sea divides the city and provides a fine harbor. Right: The first step in fashioning a cup of famous Danish porcelain. Below: Ancient whitewashed churches with red-tiled roofs, Gothic in style, dot the countryside. Bottom: Kronborg Castle, built by Frederik II, overlooks the sound at Elsinore. All photos © Danish Information Office and Danish National Travel Office



DENMARK



Amalienborg Palace, Copenhagen, residence of the Danish king. Equestrian statue of Frederik V at right.



Above: Herring smokehouses on Bornholm Island. Women are processing the herring which provides the livelihood in this fishing village. Left: A modern apartment house in Copenhagen. Below: Red Danish dairy cattle browse beside this pleasant farmhouse on Fyn Island.

All photos © Danish Information Office and Danish National Travel Office



while at the same time granting concessions to both Danes and Germans. In January 1848, King Frederick VII ascended the throne, but shortly thereafter, the French February Revolution broke out. In Copenhagen, the National Liberals then succeeded in making the king appoint a responsible Cabinet mostly of National Liberals, with the Eider (Ejder) River boundary as their platform. The following day insurrection broke out in Holstein, resulting in the Three Years' War (1848-1850). Until 1849, the rebels were supported by Prussia, but on account of Russian pressure, that state withdrew from the conflict which then ended with the subduing of the insurgents. At the final treaty arrangements in 1851-1852, it was stipulated however that Schleswig should not be more closely annexed to Denmark than the German Holstein.

Constitutional Changes.—A new constitution was promulgated in 1849, autocracy giving place to a limited monarchy. The following years were principally absorbed by the constitutional question, combined with the position of the two duchies. After repeated attempts to solve the question in conformity with the peace agreement of 1851-1852 (the Whole-State policy), which was stranded on the obstruction of the Holsteiners, a new constitution was formed in 1863, by which Schleswig was incorporated with Denmark. This constitution was signed by Christian IX (r. 1863-1906), the first king of the house of Glücksborg. The German chancellor, Bismarck, took this occasion to attack Denmark. Austria and Prussia in combination conquered the whole of Schleswig and Holstein, and under the Treaty of Vienna in 1864, Denmark had to cede all the land beyond the Kongeaa.

Between the two wars a series of laws were passed which economically as well as politically signified the victory of liberalism in Denmark, but after 1864 a constitutional fight of long duration prevailed in the Danish nation.

The peasants and the Liberals of the cities desired to retain the liberal Constitution of 1849, while the great landowners and the officials wanted limitation in the electorate franchise for the Folketing. Conservatism predominated, and under the Constitution of 1866 the democratic rights were in some measure limited. This resulted in a furious fight between the conservative Cabinet of J. B. S. Estrup and the Liberal Agrarians, who held the majority of the Rigsdag and maintained the view that the government should conform to the majority of the Folketing. The dispute lasted from 1875 to 1901, and Christian IX supported the policy of Estrup.

The Liberal Movement.—During this constitutional strife, a far-reaching development of economic and social nature took place in the nation, which created the foundation of present Denmark. The world crisis within agriculture in the 1880's compelled Denmark to abandon grain production and switch to products in refined forms, such as butter, pork, and eggs. This movement was led by the farming peasants through their cooperative establishments of dairies and slaughterhouses. The great landowners were outdistanced, and the economic center of gravity swung from them to the peasants. From about 1870 there began in Denmark an industrial activity which caused an

expansion also of commerce and shipping. Socially this period of Danish history belongs to the peasants. Spiritually influenced by N. F. S. Grundtvig and the rural high school inspired by him, they effected the immense rearrangement of Danish agriculture which since then has been the foundation of the national economy. Further industrialism caused the birth of the labor movement. After 1870 the first trade unions came into existence, and later on the laborers organized themselves politically into the Social Democratic Party which worked for a reformatory system. In 1898 the United Trade Unions were organized and the employers combined in an association of their own. In 1899, society saw the first great labor struggle in Denmark.

During the conflict between the Estrup Cabinet and the Folketing, the latter body applied the tactics of rejecting the Treasury bill, and most other bills brought in by the government, through constant blocking (*Visnepolitikken*). The government answered with provisional Treasury laws. Through such resources, for instance, the fortification of Copenhagen was carried out. In 1886, however, the Liberal Party was split into two groups, and during the following years a number of bills were carried, necessitated by industrialized society (poor laws), and a law dealing with old age support. In 1899 a law was passed stipulating that large estates be parceled out for cottage farmers.

Around 1900, the Conservative Party had lost influence, and in 1901 the first Cabinet of Liberal groups was received by the king, thereby introducing parliamentarism in Danish politics (*Systemskiftet*). During the later years, various cabinets carried through a line of important legislation realizing the ideas of the Liberals, but in 1905 this party was split into a moderate and a radical wing, following which the Radicals, supported by the Social Democrats, took over the government in 1909. In 1906, Frederick VIII ascended the throne, followed after six years reign by his son, Christian X (r. 1912-1947). In 1913, the Radicals and the Social Democrats in combination gained a majority in the Folketing, and the Radicals formed a Cabinet (with Carl Theodor Zahle as prime minister) which sat until 1920.

Neutrality Policy.—Danish foreign politics after 1864 had centered around the desire fulfillment of a promise in the Austro-Prussian peace treaty of 1866 (Art. 5, Treaty of Prague), that after a universal vote, North Schleswig should have a right to return to Denmark. But in 1878 all hope had to be abandoned when the two powers between them decided at the Berlin Congress to abolish this stipulation. After this, Denmark went in for a declared neutrality policy, and the Radicals combined this with a policy that aimed at drastic reduction of Danish military forces.

When World War I broke out in 1914, Denmark proclaimed her neutrality, but on August 5, Germany inquired whether Denmark would mine its waters; otherwise Germany would do so herself. The question was answered in the affirmative by the Danish king. The war caused Denmark many external and economic difficulties. Internally, a number of restrictions were introduced to assure the nation of the most important goods. Finally in the midst of wartime 1915, a revision of the constitution was effected,

by which all women received the franchise, and privileged suffrage to the Landsting was abolished. An important bill on parceling out land was carried in 1919. In foreign politics strict neutrality was adhered to, in close understanding with other Scandinavian countries. During 1916, the Danish West Indian Islands (Virgin Islands, q.v.) were sold to the United States.

The Social Democrats.—Great questions awaited decision after termination of the war. In 1918 relations with Iceland were altered, so that in the future the island would be an independent nation in personal union with Denmark; further, the defeat of Germany made it possible for Danish Schleswig to return to Denmark. Conforming to the Fourteen Points of President Woodrow Wilson, the Rigsdag wished to have the question decided according to the principle of nationality. This took place through a universal poll in the duchy, by which the northern part of Schleswig as far as Flensburg Fjord returned to Denmark. During the solution of this question a change of government took place, the Cabinet of the Liberals with Prime Minister Niels Neergaard taking over administration (1920–1924). Postwar developments were characterized by economic problems, war restrictions were suspended, and a trade crisis, followed by bank failures, unemployment, and political unrest set in. In 1924 the Social Democrats took over government for the first time, with the Cabinet of Thorvald Stauning (1924–1926), followed by the Liberals headed by Th. Madsen-Mygdal (1926–1929). The latter Cabinet conducted an economic and social policy on the lines of liberalism, standing for limitation in state expenses and for social legislation. When, however, in 1929 this government ran into a dispute with its supporting party, the Conservatives, regarding army organization, it was replaced by a Cabinet of Social Democrats and Radicals combined.

The Stauning-Munch Cabinet (1929–1940) instituted reforms during a time characterized by the difficult situation into which Denmark was brought by the economic world crisis following 1929. Politically the government coalition was strengthened by the election in 1930, and in 1936 it acquired a majority also in the Landsting. The wing parties had no success at the polls; a Communist group obtained two to three mandates in the Folketing, and a Nazi group after the German pattern had no representation until 1939. The most important reforms were the criminal law of 1930, the military organization of 1932 and 1937, greatly reducing grants for army and navy, the social reform laws of 1933, and the communal election law of 1936.

As a result of the economic crisis, Denmark had to leave the gold standard in 1931, and the British-Ottawa agreements compelled a rearrangement of Denmark's agricultural export. Imports also had to be readjusted. This was effected by important commercial agreements with England and Germany after 1933. At the same time, expenditure of foreign values was put under the control of a central office. After a compromise with the Liberal Party, a large monetary support to agriculture was decided upon in 1933, and the continuation of social legislation was assured.

Toward the end of this period, political interests were largely directed toward a constitutional change, proposed by the government in

1938; it aimed at a decrease in election age from 25 to 21 years and the complete abolishment of the Landsting for a one-house system. A universal poll in 1939, however, rejected this proposition.

The foreign policy of Denmark after 1920 was determined by the League of Nations. When in the 1930's the influence of this body was weakened, the Danish policy became one of strict neutrality. In 1931 a dispute with Norway regarding the possession of East Greenland was brought before the Permanent Court of Arbitration at The Hague and the verdict was given in favor of Denmark.

World War II.—After 1933 the paramount problem in foreign politics was Denmark's relation with Nazi Germany. The culmination of Denmark's neutral attitude toward this mighty and difficult neighbor was the nonaggression pact of May 31, 1939. When war broke out, Denmark confirmed her neutrality, and during the following months attempted to uphold commerce with both England and Germany.

Germany did not intend, however, to respect the nonaggression pact of 1939. Nazi plans for extending their front against England along the North Sea and the Atlantic resulted in the assault on Denmark, April 9, 1940. After a short defense, the Danish government was compelled, under protest, to bow to foreign occupation in exchange for a German promise not to interfere with Denmark's integrity and political sovereignty. The following day the Danish Cabinet was augmented by representatives of all the great parties, and on July 8, was again organized with Erik Scavenius (Radical) as foreign minister. Following this, great activity was shown by the Germans to win over the Danish population, but herein they did not succeed, and the Nazi Party's attempt to obtain the government was thwarted. A national movement united the Danish people against the occupants. While the Danish government for several reasons considered itself compelled to enter into a limited cooperation, the plans for Denmark's inclusion under German hegemony were rejected by all classes of the nation, who stood upright in defense of Danish democracy and institutions. The beloved center of national consolidation came to be King Christian X, who received tremendous ovations on his 70th birthday, Sept. 26, 1940.

From October of that year, however, the Germans commenced openly to break their promises of April 9 and interfere with the internal affairs of Denmark. The minister of commerce, J. Christmas Møller, had to retire from Danish politics after a demand from the occupying forces. The same happened to several Social Democratic leaders in the beginning of 1941. More serious encroachments on Danish life commenced after Germany's attack upon the Soviet Union in June 1941; the Germans now started wholesale arrests within all parties and classes of the population. The Communist Party was prohibited, and the Germans formed a corps of Danish volunteers to fight on the eastern front, but its number was diminutive. On Nov. 25, 1941, the government was compelled to join the Anti-Comintern Pact, which caused the first serious demonstration against the Germans. On the king's birthday, Sept. 26, 1942, a new conflict occurred. When King Christian—according to Hitler's opinion—answered the latter's telegram of congratulation in a rather cool manner, a pro-

longed crisis resulted. This was not calmed down until the government had been reconstructed with Erik Scavenius as prime minister on Nov. 8, 1942. This also was a breach of the German promises of April 9, 1940.

The active resistance against German rule now began to take form. The first official signs thereof were when several Danish diplomats abroad, commencing with Henrik Kauffmann in Washington, D.C., severed their connections in 1941 with the then Danish government. On April 9, 1941, Kauffmann had concluded an agreement with the United States regarding the latter's occupation of Greenland so long as the safety of the Western Hemisphere should be threatened. In May 1942, former Minister J. Christmas Møller left Denmark and headed the Danish movement in London.

During the autumn of 1941, contact was established between the Danish resistance organizations and England, and the first acts of sabotage took place. During the war the total number of such actions amounted to 2,671. June 1941 saw the first illegal newspapers, but at the end of the war there were 225 such publications. In the summer of 1943, the leaders of all active forms of resistance were united in the Danish Freedom Council (Frihedsraadet), which contained representations for the various groups who expressed the active resistance attitude.

The constant sabotage and resistance acts finally led to a definite breach with the Germans on Aug. 29, 1943; the Danish ministry left the government and the Germans stepped in. The Danish Army was dissolved and the navy was sunk by the Danes. Jewish persecutions began and counterstrokes against Danish sabotage acts were instituted from the German side. In September 1943 the first execution took place. This event accentuated the resistance, and on June 30, 1944, the population of Copenhagen established a general strike against the Germans, which ended in partial defeat for the invaders. On Sept. 19, 1944, the Danish police force was abolished and many members deported to Germany, while the Germans established a private terror corps, the Hipos. Sabotage and resistance now took other extension measures, and numerous groups all over the country prepared themselves for the final fight against the occupation forces. This, however, did not take place for liberation came to Denmark on May 5, 1945, through the German capitulation.

On June 17, 1944, the union between Denmark and Iceland was severed. Following deliberations with the Freedom Council, the Rigsdag in May 1945 set up the Cabinet of Vilhelm Buhl, consisting of representatives of both the liberty movement and the political parties. During the summer of 1945, this Cabinet issued various penal laws against national traitors. After the elections on Nov. 6, 1945, the Liberal (agrarian) government of Knud Kristensen succeeded in power. Following a conflict with his supporters in Parliament on the policy to be pursued with regard to Southern Schleswig, he dissolved the Folketing in the autumn of 1947. The elections of October 28 resulted in a Socialist minority government with Hans Hedtoft as premier.

As in other European countries, the postwar period has been marked by economic difficulties caused by rebuilding the national structure of Denmark. On April 20, 1947, King Christian X died and was succeeded by his son, Frederick IX.

See also separate biographies of Danish rulers.

SVEN HENNINGSEN,

Lektor, University of Copenhagen

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DENNER, dën'ér, Balthasar, German portrait painter: b. Altona, Nov. 15, 1685; d. Rostock, April 14, 1749. He was painter to several courts, executing portraits of princes and dignitaries, and was noted for his extraordinary minuteness of finish. Among his works are *Head of an Old Woman*; for which Charles VI paid 4,700 florins; and *Head of an Old Man*, both in the Vienna Museum; and many canvasses in other famous galleries.

D'ENNERY or **DENNERY**, dën-ré' Adolphe Philipe. See **ENNERY**, ADOLPHE PHILIPPE DE.

DENNEWITZ, dën'në-vīts, Germany, village in the province of Brandenburg, Prussia, famous for the battle between the French and Prussians, Sept. 6, 1813, the former commanded by Ney (under whom were Oudinot, Bertrand, Reynier and Arrighi), the latter by Tauenzien and Bülow. Forty thousand Prussians maintained their ground for several hours against 80,000 French; and on the arrival of the Russian and Swedish battalions victory declared in favor of the allies, who, after the Russians and Swedes came up, were far superior in numbers. The French were defeated, and fled in disorder, leaving behind them on the field of battle 15,000 in killed, wounded and prisoners and 43 pieces of ordnance. The allied, mostly Prussian, losses totaled about 9,000.

DENNIE, Joseph, American essayist and editor: b. Boston, Mass., Aug. 30, 1768; d. Philadelphia, Pa., Jan. 7, 1812. During the siege of Boston in 1775 his parents moved to Lexington where the boy attended a dame school. Later he studied in a commercial school, then worked in a countinghouse. Showing no aptitude for business, his father sent him to Harvard. Prepared by Rev. Samuel West of Needham, he entered college as a sophomore and graduated with his class in 1790. For three years he was a law clerk at Charlestown, N. H. Admitted to the bar in 1794, he soon abandoned the law for literature. Between 1792 and 1802 he wrote a series of 29 periodical essays called the "Farrago," briefly edited a Boston weekly devoted to belles-lettres (1795), and returning to New Hampshire settled at Walpole where he became

the leading spirit of a group of young intellectuals. For Walpole's newspaper, the *Farmer's Weekly Museum*, of which he became editor in 1796, he wrote a new series of miscellaneous essays entitled the "Lay Preacher." Their strong Federalist bias soon earned him a national reputation, and his services to the party brought him an appointment as personal secretary to Timothy Pickering, President Adams' secretary of state, and an editorial position on Fenno's *Gazette of the United States*. At the same time William Cobbett offered to publish an edition of the "Lay Preacher." But the bright prospects that brought him to Philadelphia in the fall of 1799 proved illusory: in 1800 Pickering was dismissed from the Cabinet; Jefferson's election ending Federalist rule lost him his place on the *Gazette*; Cobbett, convicted of libel and heavily fined, returned to England before he could arrange publication of the essays. However, Dennie achieved a personal success in Philadelphia and with Asbury Dickens, a bookseller, founded in 1801 *The Port Folio*, a weekly devoted to literature and politics which soon boasted a distinguished list of contributors, American and British. Until the founding of the *North American Review* in 1815 it was the leading literary magazine in the United States. Dennie's reputation as a writer rests on his 118 "Lay Preacher" essays published from 1795 to 1808.

DENNIS, Graham Barclay, American capitalist: b. London, England, June 1, 1855; d. Spokane, Wash., Aug. 18, 1923. He was brought to the United States in childhood and for a time lived in Boston and Cincinnati. After studying at Bethany College, he served successively as city editor and business manager of the *Dayton Daily Journal* (1875-1879). In 1885 he moved to Spokane where he published the *Spokane Miner* and engaged in real estate and mining. He organized and built the Ross Park Electric Railway (1889) one of the first electric lines in the West.

DENNIS, John, English dramatist and critic: b. London, 1657; d. Jan. 6, 1734. In 1697 he produced a comedy entitled *A Plot and No Plot*, which was followed by several dramatic pieces and poems of little value. He also became a political writer for the Whig Party. The irritability of his disposition, heightened probably by the unprosperous state of his finances, involved him in perpetual broils, and made him a sort of standing jest with the wits of his time. He wrote some severe strictures on Addison's *Cato* and Pope's *Rape of the Lock*. Pope in return gave him a place in the *Dunciad*, and in conjunction with Swift produced a sarcastic tract entitled *Narrative of Dr. Robert Morris, Concerning the Strange and Deplorable Frenzy of John Dennis*. The most important of his critical essays was *The Advancement and Reformation of Modern Poetry* (1701). Consult Paul, H. G., *John Dennis: His Life and Criticism* (New York 1911).

DENNIS, Louis Munroe, American chemist: b. Chicago, May 26, 1863; d. Ithaca, N. Y., Dec. 9, 1936. In 1885 he was graduated from the University of Michigan, and afterward studied at Munich, Dresden and Wiesbaden. From 1887 to 1889 he was instructor, 1881-1893 assistant professor and after 1900 professor of inorganic and analytical chemistry at Cornell University. He was head of the department of

chemistry from 1903. He published *Chemical Problems in Inorganic Chemistry* (1890); *Elementary Chemistry* (1902), with Frank W. Clarke; *Laboratory Manual of Elementary Chemistry* (1902), with same; *Manual of Qualitative Analysis* (1902), with Theodore Whittlesey; *Gas Analysis* (1913); with M. L. Nichols, *Gas Analysis* (1929).

DENNIS, William Cullen, American lawyer: b. Richmond, Ind., Dec. 22, 1878. He was graduated at Earlham College in 1896 and from Harvard Law School in 1901. In 1902-1904 he was assistant professor of law at the University of Illinois, at Stanford University 1904-1905, at Columbia 1905-1906 and professor of law at George Washington University 1906-1909. From 1906 to 1910 he was assistant solicitor of the Department of State. In 1909-1910 he was United States agent before the Hague Tribunal in the United States-Venezuela arbitration case; agent of the United States in the Chamizal case with Mexico before the International Boundary Commission 1910-1911, secretary to Chief Justice White in the Costa Rica-Panama Boundary Arbitration 1911-1914, legal adviser to American Plebiscitary Commission in Tacna-Arica. In 1929 he became president of Earlham College.

DENNISON, Aaron Lufkin, American watch manufacturer: b. Freeport, Me., Mar. 6, 1812; d. Boston, Mass., Jan. 9, 1895. After three years as apprentice to a Brunswick, Me., watchmaker, he went to Boston in 1830 where he became a skilled journeyman. Twenty years later he designed the first factory-made watches in the world for the American Horologue Company which, after its removal from Roxbury to Waltham and several changes of name, became the American Waltham Watch Company. During his lifetime he was known as the "Father of American Watchmaking," and is believed to have been the first to construct the entire watch under one roof by machinery manufacturing interchangeable parts.

DENNISON, Walter, American educator: b. Saline, Mich., Aug. 9, 1869; d. March 18, 1917. Graduated at the University of Michigan in 1893, in 1894-1895 he studied at Bonn University. He was instructor in Latin in the University of Michigan in 1897-1899, professor of Latin and Roman archaeology at Oberlin College 1899-1902, and junior professor of Latin at the University of Michigan 1902-1910, and professor of Greek and Latin at Swarthmore College 1910-1917. In 1908-1909 he was professor of Latin at the American School of Classical Studies at Rome. He wrote *A Junior Latin Book*, with John C. Rolfe (1898); and he also edited *Livy, Book I and Selections from Books II-X* (1908). He revised F. W. Kelsey's *Topical Outline of Latin Literature* (1899) and H. S. Frieze's *Virgil's Aeneid* (1902).

DENNISON, William, American statesman: b. Cincinnati, Ohio, Nov. 23, 1815; d. Columbus, Ohio, June 15, 1882. He was graduated at Miami in 1835 and became a lawyer, being elected to the Ohio legislature in 1848. He became governor of Ohio in 1860, and rendered invaluable aid to the Union cause throughout the Civil War. President Lincoln appointed him postmaster general in 1864, an office which

he retained under President Johnson, resigning in 1866. Dennison College owes much to his liberality.

DENNISON, village, Ohio, Tuscarawas County, altitude 908 feet, on the Pennsylvania Railroad, 100 miles northeast of Columbus. It makes sewer pipe, clay products, batteries, sheet iron, and has a meat-packing plant. It has a mayor-and-council government; has a public library and a hospital. Pop. (1950) 4,432. See also URICHSVILLE.

DENNY, George Hutcheson, American educator: b. Hanover County, Va., Dec. 3, 1870. He was graduated at Hampden-Sydney College in 1891. He taught at Pantops Academy, Charlottesville, 1892–1896, and from 1896 to 1899 was professor of Latin and German at Hampden-Sydney College. He came to Washington and Lee University as professor of Latin in 1899, became acting president in 1901, and was president from 1902 to 1911 when he was made president of the University of Alabama. He was chairman of the Rhodes Scholarship Committee for Alabama 1912–1937, and president of the Alabama State Board of Arbitration 1912–1916. He has received honorary degrees from Tulane, Washington and Lee, Alabama, and other universities. He wrote *The Subjunctive Sequence After Adjective and Substantive Predicates and Phrases* (1896). He contributed to the Library of Southern Literature *The South in the Building of the Nation*. Since 1937, he has been chancellor of Alabama University.

DENON, dē-nōn', **BARON Dominique Vivant**, French artist, diplomatist and author: b. Châlons-sur-Saône, Jan. 4, 1747; d. Paris, April 27, 1825. He studied law and drawing with Noël Hallé. He was attached to embassies at Petrograd, Switzerland and Naples, successively. At Ferney, Switzerland, he painted the portrait of Voltaire and drew the well-known picture *Déjeuner de Ferney*. At Naples he took advantage of the opportunity to collect old masters and make portraits; and with the Abbé de Saint-Non wrote *Voyage pittoresque de Naples et de Sicile* (1788). Becoming acquainted with Bonaparte, he accompanied the general in his campaigns in Italy and Egypt, and Desaix de Veygoux in Upper Egypt. The work which was the result of his journey, *Voyage dans la Basse et la Haute Égypte*, was issued in 1802. When he returned to Paris with Bonaparte he was appointed inspector general of the museums and all the works of art executed in honor of the French successes—monuments, coins, the erection of the triumphal pillar in the Place de Vendôme, etc. He accompanied Napoleon in all his campaigns, and employed himself in drawing and in selecting those masterpieces in the conquered countries, which were taken to Paris as trophies. After the abdication of the emperor he retained his office, but was deprived of it in 1815, in consequence of having joined Napoleon on his return from Elba. He retained, however, his place in the institute. From that time on he lived in retirement, preparing engravings and lithographs of his splendid collection of works of art during the remaining years of his life. In 1826 appeared at Paris the *Description des objets d'art composant le cabinet de feu M. le Bar. V. Denon*. In 1872–1873 his etchings were published with an introduction by La Frizelère.

DENS, Petrus, author of a manual of Catholic theology: b. Boom, Belgium, Sept. 12, 1690; d. Mechlin, Feb. 15, 1775. He is not the author of *Theologia ad usum seminariorum*. The work was published under his name by the professors of Mechlin and probably contained much of Dens' teaching. It is still used, with modifications, by the professors of Mechlin. He was a professor in the diocesan seminary of Mechlin and for 40 years was president of the institution. He was also honored with several offices of importance in the diocese of Mechlin—pastor of the metropolitan church there, president of the seminary, canon penitentiary, synodical examiner and archpriest of the chapter. He wrote treatises on penance, on the virtue of religion, and other subjects.

DENSITY, a term denoting the mass per unit of volume in a body. (See SPECIFIC GRAVITY.) The density of the earth has been determined as about 5.527. See GRAVITATION.

DENT, Frederick Tracy, American soldier: b. White Haven, Mo., Dec. 17, 1821; d. Denver, Colo., Dec. 24, 1892. He was graduated from the United States Military Academy at West Point in 1843 and served in the Mexican War, being engaged in the siege of Veracruz and the battles of Churubusco, and Molino del Rey. He took part in the Yakima expedition (1856), in the Spokane expedition, and in the Snake River expedition (1860). During the Civil War he commanded a regiment in the Army of the Potomac in 1863; was stationed in New York in September 1863, where riots were feared; and was Grant's aide-de-camp throughout the Richmond campaign. He was secretary to President Grant during his first administration. He retired from active service in 1883 with the rank of colonel in the regular army.

DENT, John Charles, Canadian author: b. Kendal, Eng., Nov. 8, 1841; d. Toronto, Sept. 27, 1888. He came to Canada in early life, and was called to the bar of Upper Canada in 1865. Returning to England, he engaged in journalism; afterward pursued that vocation in Boston, Mass., and in 1870 joined the staff of the *Toronto Globe*. He was the author of *The Canadian Portrait Gallery* (1880); *The Last Forty Years*; *Canada Since the Union of 1841* (1881); *The Story of the Upper Canadian Rebellion* (1884). He also published a volume of short stories, *The Gerrard Street Mystery, and Other Weird Tales* (1884).

DENTAL CORPS, a branch of the United States Army established by the act of March 3, 1911. It consists of dental surgeons and acting dental surgeons, in all not more than one to each 1,000 enlisted men in the army. The number of dental surgeons is limited to 60. Acting dental surgeons have a status similar to that of contract surgeons. They must be graduates of a standard dental school and are appointed by the surgeon general after a physical examination of the same standard as that required for a commission in the medical corps of the army and a professional examination involving oral and written questions and clinical work. The dental surgeons, who rank as first lieutenants, are appointed from among those acting dental surgeons who have served for three years with a clear record. The physical examination is given over again, and a new profes-

sional examination, consisting of a written and a practical part, must be passed. Officers of the Dental Corps rank next below officers of the Medical Reserve Corps, and their right of command is limited to the Dental Corps. See also MEDICAL ORGANIZATION, UNITED STATES ARMY—*Medical Department Officers Corps* (Medical and Dental Corps). For requirements for appointment to the Dental Corps of the United States Navy see MEDICAL ORGANIZATION, UNITED STATES NAVY—*Dental Corps*.

DENTAL HYGIENE. Although the importance of dental hygiene has been increasingly appreciated in modern times, the ancients were by no means unaware of it. History shows that long before the Christian era dental hygiene as a health measure was valued so greatly that certain of its practices were incorporated into religious rites.

Ancient Arabs, obeying instructions in the Koran, cleansed their teeth with a *sivak* consisting of the frayed end of a palm or myrtle twig. Early Greeks compounded dentifrices of a variety of different abrasives, including pumice, talcum, powdered emery, coral, and iron rust. Diocles wrote that "every morning you should rub your gums and teeth inside and outside, with your bare fingers and with finely pulverized pennyroyal, and remove the adherent particles of food." The Romans set great store by healthy teeth. White teeth, wrote Cicero, were the first requirement of beauty. Many kinds of substances went into the dental cosmetics of the early Romans: the bones, hoofs, and horns of certain animals, crab shells, eggshells and oyster shells, to mention only a few. These were burned, powdered, and mixed with astringents, so that the resulting mass might serve the dual but doubtful purpose of whitening the teeth and strengthening the gums. The Parsi, a migrant to India from ancient Persia, considered the use of the toothpick a religious rite, and Omar Khayyam is reported to have cleansed his teeth with a golden toothpick—studying metaphysical problems the while. Wooden, quill, gold, and silver toothpicks have been traced to early Roman times, and many modern museums have on display artistically designed toothpicks, some inlaid with precious stones, that were used by the noblemen and highborn ladies of the Middle Ages.

The bristled toothbrush, now one of our chief aids in dental hygiene, is a comparative newcomer. Only three centuries have passed since its first appearance. Sophia, electress of Hanover, mentions it in her memoirs written in 1640. During the 18th century it took its place with chewsticks, sponges, cloths, and other devices for the home care of the mouth, but its benefits were questioned by many dentists. Pierre Fauchard, French surgeon, regarded as the father of dentistry, in 1728 condemned toothbrushes made of horsehair as being too rough. Robert Bunon, another famous dentist of that day, considered sponges preferable. "The fine sponge enters all corners and even under the edges of the gums."

Despite such opposition brushes gradually supplanted sponges for use in dental hygiene, and by the time of the American Revolution colonial dentists considered the sale of toothbrushes and dentifrices a rightful and indispensable part of their service to society. Isaac Greenwood, whose son John Greenwood later became one of

George Washington's several dentists, in 1789 announced in the public press that he sold "brushes, dentifrices and tooth powder proper for the teeth and gums." Although dentists no longer sell toothbrushes and dentifrices directly, they are indirectly responsible for millions of sales of such articles by reason of their tireless promotion of dental hygiene.

Sugar and Dental Decay.—Whereas the ancient healers gave advice that was largely empirical, the advice of the modern dentist is based on scientific evidence. Good habits of dental hygiene contribute to the health of the hard and soft tissues of the mouth, that is, of the teeth, of the bone that supports them, and of the gums. Dental researchers agree that dental decay (caries) is caused by acids formed by bacteria acting on carbohydrates, especially sweets. These acids, if retained on the teeth, attack the enamel and dentine. Therefore, the early removal of all food deposits from the teeth helps to prevent dental decay. Researchers also agree that one of the common causes of diseased gums is the irritation resulting from food and tartar deposited on the necks of the teeth. In such instances the removal of the deposits allows the gums to return to normal and prevents the development of a severe gum disorder commonly referred to as pyorrhea.

A successful program of dental hygiene depends on two types of services: personal and professional. Personal service, or home care of the mouth, includes the strict observance of an intelligent dietary regime as well as strict observance of the established rules for maintaining a healthy mouth. For the average individual, a well balanced diet, such as is recommended by nutritionists for general health, is all that is required for dental health. Such a diet will contain a minimum of sweets, including pastries, jams, jellies, free sugar, and confections. Since sugar is a predisposing cause of decay, one of the first steps in the control of the disease and hence a prime requisite of dental hygiene is to remove the cause. One way to do this is by restricting the intake of sugar to a minimum, and the other way is by removing the residue of sugar on the teeth by proper brushing.

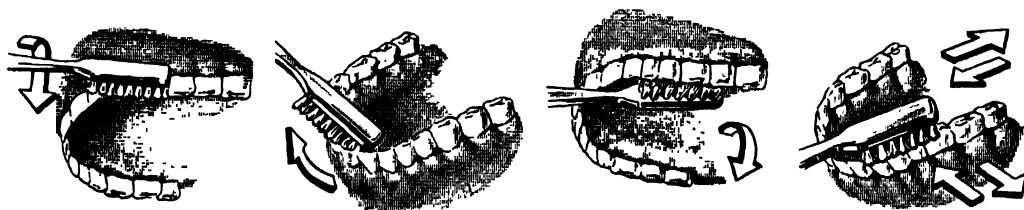
The mouth should be cleansed immediately after eating, particularly if the meal or snack contains sweets. Because different mouths are shaped differently and because the teeth in different mouths are arranged differently, the dentist should be asked to demonstrate the method best suited to a particular mouth.

A simple method of brushing the teeth and one basically satisfactory to many people consists of brushing the upper teeth with a downward motion and lower teeth with an upward motion. The inside surfaces and the chewing surfaces, as well as the outside surfaces of the teeth, should all be brushed. The teeth should never be brushed crosswise, for this stroke cannot reach into the crevices and may injure both the gums and the teeth. After each brushing the mouth should be rinsed thoroughly with water as warm as is comfortable in order to remove the loose particles. Rinsing also helps to keep the mouth clean and the breath free from odors.

The first requisite in brushing the teeth is at least one good toothbrush. Children should use a small brush, adults should use one of medium size. Many dentists recommend a brush of not more than seven tufts of bristles as the



Brushing the teeth. Teeth should be brushed correctly and thoroughly, immediately after eating, for maximum benefit in preventing tooth decay and keeping gums healthy. A dentist should be consulted for the technique most suitable for each individual. A basic method, recommended for general purposes, is illustrated in the four accompanying pairs of illustrations, from left to right. Outside surface with a rolling motion, brush over the gums and teeth toward the biting surface, always in the direction in which the teeth grow. Inside surface of front teeth with a pulling motion, draw bristles from gums to biting edge. Inside back teeth roll brush across gums to grinding surface. Chewing surfaces of all teeth: with forward and backward, then sideways motions, force bristles into all grooves and spaces. Repeat each stroke on each surface at least six times.



right size for adults. The bristles should be fairly stiff and set in widely spaced tufts so that they can easily be kept clean. It is economical to have at least two toothbrushes and to use them alternately. After the brush is used it should be rinsed thoroughly in cold water, shaken thoroughly, and hung in a light airy place well separated from other brushes.

Purpose of Dentifrices.—Dentifrices are generally mixtures used on the teeth and gums in conjunction with a toothbrush. No one has ever been able to prove that they have medicinal, curative, or prophylactic (protective) value. Those in daily use should not contain harmful or objectional ingredients. Their purpose is to assist the toothbrush in cleansing the surfaces of the teeth. Some manufacturers make extravagant claims for their products. Their dentifrice "cures acid mouth," "corrects bad breath," and "whitens teeth." Others claim that their product will stop the action of acids that cause dental decay. Scientific evidence has so far shown that none of these claims is justified. The Council on Dental Therapeutics of the American Dental Association says: "There is continuing effort to obtain additional dental benefits from dentifrices through the inclusion of agents designed to have some specific biological or therapeutic action. However, the evidence to date indicates that when such dentifrices are employed as adjuncts to supervised toothbrushing in controlled clinical investigation, their superiority over conventional dentifrices has not been established." The cleansing power of a tooth paste or powder is not as important as the type of toothbrush used and the manner in which it is used. Mouthwashes have not been shown to serve any useful purpose other than to aid in the removal of food and

debris which have been loosened by brushing. They cannot remove film from teeth, correct acid mouth conditions, or cure bad breath. In some instances the judicious and careful use of dental floss is helpful. The careless use of dental floss, however, can injure the soft gum tissues. The indiscriminate and careless use of toothpicks is both harmful and socially taboo.

Home care of the mouth alone, however, is inadequate in most instances for the control of dental decay and the prevention of gum disorders. It represents only one of the procedures that must be used in proper dental hygiene. It must go hand in hand with professional care. Professional service in dental hygiene (dental prophylaxis) may be rendered by the dentist or by the dental hygienist under the direction of a dentist. In the widest sense the term "oral prophylaxis" includes preventive and restorative procedures which establish a normal functioning of the teeth. Ordinarily, however, oral prophylaxis is understood to consist of the cleaning and polishing of the teeth. This procedure consists (1) of the removal of stains and of calcareous and other deposits (commonly called tartar) from the surfaces of the teeth and (2) of the restoration of the luster of the teeth by careful brushing and polishing. Dentists recommend that the average patient receive this preventive type of service at least once, and preferably twice, a year.

The Dental Hygienist.—Formerly oral prophylaxis was performed only by licensed dentists. During the last quarter of a century a new auxiliary aid has developed which promises to broaden the dentist's service. This aid is the dental hygienist. Young women who have been graduated from a two-year course of training and have passed a state board examination are

licensed to perform oral prophylaxis under the supervision of a dentist. There are over 30 schools in the United States that offer courses for dental hygienists, and the number of young women attracted to this profession increases annually.

A new development has recently come about which promises much in the field of dental hygiene. It consists of the addition of fluoride to the extent of one part per million to communal drinking water. Studies of fluoridation projects in the middle years of the century in several large communities indicate that the process will reduce the incidence of dental decay among children by from 60 to 65 per cent. Other studies indicate that the local application of a fluoride solution to the teeth of children also inhibits decay. Thus, for the first time, scientists have provided a simple, inexpensive method of improving the standards of dental hygiene and the standards of dental health in America. See also DENTISTRY, PUBLIC HEALTH.

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LON W. MORREY, D.D.S.

DENTALIUM, dĕn-tă'li-ŭm, a genus of marine mollusk in the class Scaphopoda. The name, however, is broadly applied to many closely related genera. The shells are somewhat like an elephant's tusk in shape and are usually called tooth shells. The mollusks bury themselves upright in the sand and capture their food by means of their filamentous tentacles. The curved shell is open at both ends and is usually white or gray, though a large Philippine species is colored green for most of its length. It is the largest known species in the genus and may reach a length of nearly six inches. A few species are found just below the low-tide line, but the majority of them live in deep water, and a few in the profound depths of all the oceans. A species on the California coast was formerly much sought after by the Indians for personal adornment. Strings of this shell served as money, much as did the wampum made of shell beads on the New England coast.

DENTARIA, dĕn-tă'rĭ-ă, known also as toothwort, pepperoor, and crinkleroot, is a genus of about 30 species of small spring-blooming, perennial herbs found in the Northern Hemisphere and belonging to the mustard family (Cruciferae). The names refer to the toothlike projections often found on the creeping rootstocks (rhizomes) which are edible and taste like water cress. The lower leaves are frequently different from the leaves crowded toward the top of the stem. The few flowers are relatively large and are white, rose, or purple. Several species are cultivated.

DENTATUS, dĕn-tă'tŭs, **Manius Curius**, Roman statesman, fl. 290–272 B.C. He was of Sabine origin and the first of his family to hold high office of state. In 290 B.C. he was consul with P. Cornelius Rufinus, and by his decisive victories over the Samnites terminated a war which had lasted for 49 years. He then marched

against the Sabines and was again successful in restoring them to the Roman protectorate. In 283 B.C. he became praetor and in 275 B.C. he was again consul, and near Benevento (Beneventum) defeated King Pyrrhus. The triumph which followed was one of the most magnificent which had ever been witnessed. In 274 B.C. he was a third time consul, and after terminating the war with the Lucanians, Samnites, and Bruttians, retired to his Sabine farm and spent the remainder of his life in cultivating it. In 272 he became censor, and in that year he built an aqueduct, the Aniensis Veto, which carried the water from the river Aniene (Anio). He was noted for his great simplicity and frugality as well as for his military and executive achievements.

DENTEX, dĕn'teks', a genus of fishes usually known in English as sea bream. It is found from England to the African Gold Coast and includes various species, but it is most common in the Mediterranean. The largest of the genus, the toothed bream, reaches a length of three feet and a weight of 20 pounds. This is a swift, voracious fish with well developed canine teeth suited to breaking open shellfish, its main article of diet. It may easily be taken on lines baited with shellfish. It is hardy and has long been a favorite fish in captivity. The ancient Romans cultivated it in ponds, and since then it has become a popular aquarium exhibit.

DENTILS, dĕn'tĭlz, in architecture, the little cubes or small squarish blocks resembling teeth, into which the square member of the bed-molding of an Ionic, Corinthian, Composite, and occasionally a Roman Doric cornice is divided. Their breadth should be half their height and the metoche (interval) between them two thirds of their breadth.

DENTINE, dĕn'tĕn, or **DENTIN**, dĕn'tĭn, bonelike structure constituting the body of a tooth, which in the crown portion is covered by enamel and in the root portion by the crusta petrosa or cementum. See also DENTISTRY, HISTORY OF; TEETH.

DENTISTRY, History of. The beginning of dentistry can be variously dated, depending on the criterion we set up as to what dentistry is. If the recognition of certain dental ills and the application of various irrational remedies are sufficient to constitute dentistry, then the origin of the science will be found in the earliest years in the history of civilized man—in Egypt, India, China and elsewhere. If the construction of gold bridges by jewelers or the removal of teeth by surgeons constitutes dentistry, then the art goes back to ancient Greece and the Etruscans. If we decide that the removal of teeth and the repair of the loss must be united in the work of one craftsman, we shall find that the first dentists lived in Rome in the 1st century. If procedures more like those practiced today are necessary to constitute the art of dentistry, then dentistry began in the Middle Ages when the first rudimentary fillings were placed. Certainly, there can be no doubt that by that time dentistry had begun.

ORIGINS

Dental Ills of Fossil Man.—The earliest races of man that we know of, human beings who

lived many thousands of years ago, suffered from most of the dental ills that we suffer from today. Dental decay, diseases of the gums and the bone supporting the teeth, and malpositions and abnormalities of the teeth and jaws existed in prehistoric times, though such conditions were less common than they are at present. Caries (decay) was rare. The most serious affliction was the excessive wear of the teeth that came from coarse food and a heavy bite. The skeletal remains and extant tools of fossil man give no evidence of any effort to remedy his dental troubles.

Natural Periods of Dental History.—An overall view of the history of dentistry reveals that the dental problems humanity has faced most constantly are: (1) the control and repair of the ravages of dental decay and its consequences, (2) the prevention and treatment of diseases of the surrounding and supporting structures of the teeth (periodontal disease, commonly called pyorrhea), and (3) the prevention and correction of bad positional relations of the teeth and jaws (malocclusion).

A general survey also shows that in each of the various periods a certain set of dental services occupied the dental operator's attention more than other services did. Thus dental history is divided into a few large periods, each characterized by its particular service. From early times, at least as early as the 5th century B.C., until about the beginning of the 18th century, the commonest service the dentist performed was the removal of diseased and painful teeth. From about 1700 to 1850 the operator was most concerned with supplying substitutes for lost teeth. From the middle of the 19th century until well into the 20th, the saving of teeth affected by caries or by pyorrhea was the dentist's chief concern, with the result that his services consisted largely of filling cavities and removing deposits from teeth afflicted with periodontal irritation. Since about 1930 the chief interest in dentistry has been directed toward the prevention and control of dental disease, especially as part of a program of public health. (See DENTISTRY, PUBLIC HEALTH.)

Early Egyptians: 3500-1000 B.C.—Skeletal remains of the early Egyptians show that the people of that far-off day suffered from the same dental troubles as modern man, though their more prevalent diseases were not the ones we suffer from the most. Five dental diseases are recorded in the medical papyri. Of these only one, loose teeth, can be identified with a disease recognized today. Some of the conditions were picturesquely described as "blood eating in the tooth" and "a tooth that gnaws to the flesh." Remedies in the form of medicinal substances were applied to the teeth. Probably no surgery, not even extraction, was practiced, and it is doubtful that even crude artificial replacements supplied lost teeth. Physicians, at least in the royal household, were assigned the care of different parts of the king's body and one had charge of his teeth. The slender means of treatment at his disposal would indicate that there was no specialization in the modern sense.

Mesopotamia: 7th Century B.C.—Dental science in the Mesopotamian kingdoms is well described in the records of Assyria preserved from the 7th century B.C. Extraction may have been practiced. The Assyrians were concerned about toothache, looseness of the teeth, their discoloration, bad breath, the excessive flow of saliva,

and possibly dental decay. The "worm" was thought to be the cause of toothache. Treatment consisted of medicinal applications and magical incantations.

Greek, Phoenician, and Etruscan.—The literature of Hippocrates (460?-377 B.C.) discussed the development of the teeth and dealt with dental diseases. Teeth were removed by surgeons, who used special forceps and extracted loose teeth only. This was the custom in all countries until well into the Middle Ages. Lost teeth were restored by gold bridges in which the missing teeth were supplied by substitutes from human beings or from the lower animals. The Phoenicians as early as the 5th and 4th centuries B.C. constructed splints for loose teeth and made bridges of gold wire skillfully fashioned.

In Italy at about the same time the ancient Etruscans constructed bridges made of soldered bands to which human or animal teeth were riveted. Those early bridges, as well as the ones of Grecian and Phoenician origin, were probably the work of skillful jewelers.

Middle Ages: 400-1500 A.D.—During the Middle Ages Arabian surgeons, and later Christian physicians and surgeons, wrote casually of dental diseases and operations in their works on the healing arts. Abul Kasim (Abulcasis), the celebrated Arabian surgeon, wrote of dental matters in the 10th century, as did Guy de Chauliac, in his *Grande Chirurgie* (*Great Surgery*) in the middle of the 14th century. Abul Kasim disapproved of the dentator, as the dental practitioner was called, and de Chauliac, although recognizing that dental operations required special skills, insisted that the dentator should operate only under the direction of a surgeon.

Late in the Middle Ages the introduction of several new and powerful instruments made possible the rapid removal of firmly rooted teeth. Most notable among those instruments were the "pelican" and straight lever—both hinged, two piece levers. They were the dental operator's chief aids until the middle of the 18th century. During the Middle Ages temporary materials such as waxes and resins were used for restorative fillings. Later, metal fillings were placed. Of these lead was probably the earliest metal resorted to, although before 1500 gold foil was sometimes used.

The Renaissance: 1500-1700.—The founding of the study of anatomy in the 16th century by Andreas Vesalius, Gabriele Fallopius, and Bartolommeo Eustachio (Eustachius) was the earliest sound scientific influence in the study of dentistry. Eustachio published (1563) *Libellus de dentibus*, the first book entirely devoted to the anatomy of the teeth.

The earliest book devoted to dentistry was the German *Zene Arzney*, published anonymously in 1530 and many times thereafter. Other early dental books were Urbain Hémar's *La Vraye Anatomie des Dents*, an anatomical compilation by a French surgeon (1582); a Spanish work, *Coloquio Breve*, by Francisco Martinez (1557); *Dissertation sur les Dents* (1679) by Benjamin Martin a French apothecary; and *Operator for the Teeth* (1685) by Charles Allen, a dentist—the earliest dental book in English. None of these works was a professional treatise.

THE 18TH CENTURY

France—Rise of Professional Literature.—With the dominance of French surgery from the

16th through the 18th century in Europe, French dentistry also became pre-eminent. At the beginning of the 18th century the professional character of French dentistry was demonstrated by the publication (1728) of a complete treatise on dentistry under the title *Le Chirurgien Dentiste ou Traité des Dents*. It was by Pierre Fauchard, a celebrated practitioner in Paris. Previously, the procedures of dentists had been regarded as trade secrets, revealed only at a price; and the publication of a full account of dental technique was revolutionary. The precedent set by Fauchard was followed through the 18th century by the publication of a number of professional volumes by distinguished French dentists, especially by Robert Bunon (*Essai sur les Maladies des Dents*) in 1743 and 1746, Etienne Bourdet (*Recherches et Observations sur . . . Part du Dentiste*) in 1757, and A. L. S. Jourdain (*Traité des Maladies et des Operations Réellement Chirurgicales de la Bouche*) in 1778.

To some extent Fauchard's example stimulated the publication of dental literature in other countries. In German lands Fauchard's book was translated, and Philip Pfaff published (1756) an excellent original work (*Abhandlung von den Zähnen*). In England Thomas Berdmore published (1768) a professional work (*A Treatise on the Disorders and Deformities of the Teeth and Gums*), and the anatomist John Hunter issued a *Natural History of the Teeth* in 1771, to which he added a treatise on diseases of the teeth in 1778.

Professional Status of Dentists.—The earliest legal recognition of the professional status of dentists came from the French kings in their statutes granted to the surgical profession, probably as early as 1577. Dental operators, who were subordinate and only partly qualified members of the communities of surgeons in Paris and other large cities, were allowed to practice within the limits of their specialty as "experts for the teeth." The rights and duties of the experts for the teeth were detailed in royal edicts of 1699 and 1768.

With the advent of the French Revolution, all surgical and medical qualifications were abolished, and any person was free to practice the healing arts.

Removal of Teeth.—The pelican, straight lever and other instruments developed during the Middle Ages were used for removing teeth throughout the 18th century. In addition, an instrument which operated on a new principle was introduced about the middle of the century. This was the key, or turnkey. By a turning motion the tooth was removed from its socket with great power in an oblique direction. This instrument, although likely to fracture tooth or bone, as did the pelican, became the favorite instrument of operators, and remained in favor until early in the 19th century.

Complete Dentures.—Eighteenth century dentures were carved from bone, ivory, or a hippopotamus' tooth in one piece; or, in the latter part of the century, they consisted of a gold base plate (made by a jeweler from an ivory model by the dentist) on which human teeth or carved blocks of teeth were mounted by riveting. Fauchard made ivory dentures with an enameled gold plate at the front of the mouth to give a more natural appearance of gums and teeth. The base plate had little or no extension over the ridges which bore the teeth or onto the palate, and the denture was held in place by the ac-

tion of springs on either side of the mouth and extending from one denture to the other. The springs gave a great deal of trouble. They were either too weak to keep the upper denture against the jaw or too strong to be comfortable for the wearer.

Until late in the century the dentist usually fitted the denture directly to the mouth, using measurements to guide his carving. If the patient was unable to visit the dentist, the patient made an impression of his own jaws with wax, and the dentist carved the denture from this pattern.

Besides the denture retained by springs, two other types of denture were occasionally employed. One was a denture suspended from the upper jaw by a pin or wire that pierced the soft tissue only or the bony ridge as well. Fauchard condemned this method. Another type of denture, employed rarely by Fauchard, was without springs or other special retention device.

Crowns and Bridges.—The only method of restoring a whole crown on the root of a tooth was by mounting an artificial tooth on a post inserted into the root canal. Bridges substituting for any number of teeth were also mounted by posts in a similar manner.

Filling of Teeth.—Fauchard and his contemporaries filled teeth with lead foil, tin foil, and gold foil. The cavity was prepared only by removing the decay and enlarging the opening for easy access. Fillings were made from long strips of metal foil that were folded, one fold against another, and wedged between the walls of the cavity with the edges of the foil standing upright so that layers of metal could not flake off. The filling of teeth was not so common as it is today. Occasionally, with a single rooted front tooth in which the pulp was exposed, the pulp was killed mechanically or chemically or by cautery, and removed. The pulp chamber in the crown of the tooth was then filled, but not the root canal.

Oral Surgery.—The French dentist Anselme L. B. Jourdain, believing that the field of surgery had widened so greatly that one person could not master all of it, proposed the specialty of oral surgery, and wrote a two-volume work on surgical diseases of the mouth (1778).

Dental Comparative Anatomy.—In England the surgeon and anatomist John Hunter developed the science of comparative anatomy and collected an enormous museum of specimens, especially in the field of comparative dental anatomy. This was a new branch of anatomical science which was developing in France also and in other European countries.

Preventive Dentistry and Orthodontics.—Among the new departments of dental science developed in the 18th century was preventive dentistry. Robert Bunon, a children's dentist in France, wrote a book in 1743 dealing with the prevention of dental decay, the control of the alignment of the teeth, and the principles of dental hygiene. His most important contribution to dental science was the discovery that disfiguring irregularities of the surfaces of the teeth (hypoplasia) are caused by certain diseases in early childhood, for instance, by rickets, scarlet fever, or smallpox.

Although the correction of irregular placement of the teeth had been practiced in earlier centuries, it was not until the 18th century that

the methods of treatment were adequately described. Usually Fauchard and his contemporaries in order to move the teeth employed threads and short strips of metal which acted as springs. Correction was for appearance only, and only the front teeth were repositioned. No attempt was made to change the size or general shape of the arch of the jaw. If teeth were crowded, one or more of them were filed down or extracted in order to give room in the existing dental arch. When the patient was past childhood or when it seemed desirable to correct the irregular alignment at once, Fauchard and other practitioners resorted to forcing the teeth into position with extraction instruments and then wiring the loosened teeth until they became firm.

DENTISTRY AS A PROFESSION: 1800-1850

Education, Organization, and Literature.—

In the early years of the 19th century there were signs in many countries that dentistry had arrived at the stature of a profession. Dental institutions of one kind and another first appeared in the United States. At the close of the fourth decade of the century, the first dental school, the first national dental organization, and the first dental periodical in the world were founded in the United States. Horace Hayden and Chapin A. Harris, dentists of Baltimore, were leaders in these developments. In December 1839 the *American Journal of Dental Science* first saw the light. Largely under the guidance of Harris, it for 20 years maintained a high standard for the profession. Early in 1840 the Baltimore College of Dental Surgery received a charter and in the same year became the first institution to teach dental students. Hayden was its first president and Harris its first dean. In the same year was founded, under the leadership of Hayden, the American Society of Dental Surgeons, the first national dental organization in the world. Harris was also author of a notable book entitled *Principles and Practice of Dental Surgery* (1845), enlarged from a shorter work appearing in 1839.

Close upon these developments in the eastern United States were similar developments farther west. The Mississippi Valley Association of Dental Surgeons was organized in 1844. The Ohio Dental College at Cincinnati was founded in 1845; and the *Dental Register*, a periodical, was first published in 1847. James Taylor and Jonathan Taft were leaders in the West. Taft was author of the first *Operative Dentistry* (1859).

In the latter part of the 18th century notable dental scientists and practitioners began to lecture on dental science and dentistry at Guy's Hospital in London. Eager to win professional standing and legal recognition for dentistry, George Waite in 1841 addressed a memorial to Parliament, the medical profession, and the public urging that the College of Surgeons establish an examining board of dentists empowered to grant diplomas to dental candidates. The request was not granted, and nothing definite was accomplished until after the middle of the century.

Comparative Anatomy and Histology.—

During the latter half of the 18th century and the early part of the 19th, the science of comparative anatomy was developing rapidly. John Hunter in England amassed an enormous collection of specimens representing many species

and arranged special exhibits to demonstrate the various types and functions of the teeth in the animal world. Even more extensively and more systematically the celebrated Georges Cuvier was developing this science in France. The study of comparative dental anatomy greatly influenced the views held by dentists regarding the nature of the teeth and their diseases. In general, the French dentists believed that the tooth that had broken through the gums was inert; whereas the English generally believed that it possessed a high degree of vitality. These views affected the English and the French theories as to the causes of dental decay.

Although teeth had occasionally been examined microscopically ever since the day of Anton von Leeuwenhoek and Marcello Malpighi in the 17th century it was not until 1835 that microscopes were sufficiently improved to make them of practical aid in studying the teeth. Anders Johan Retzius in Sweden, Johannes Purkinje in Prague, and Sir John Tomes in England almost simultaneously announced the findings of their microscopic study of the hard tissues of the teeth. For the first time scientists became aware of the presence of cementum, a hard, bonelike tissue covering the surface of the roots of the teeth. In seven years (by 1842) the wholly new science of dental histology was established. The knowledge gained from the microscopic investigation of the teeth was the dominating scientific influence in dentistry for almost a hundred years.

Removal of Teeth.—A marked reaction against the excessive removal of teeth took place at the beginning of the 19th century. The pelican had gone out of use by the close of the 18th century, and the key had fallen into disfavor by 1840. Meanwhile the forceps steadily gained in favor for the removal of even the firmest teeth. So-called "anatomical" forceps were designed. The most successful set of them consisted of ten instruments, nicely balanced and sufficiently varied in design to serve in the extraction of every kind of tooth. Perfected by the famous British dentist John Tomes in 1840, these forceps, in their basic principles, have served as models for all modern forceps.

Toward the end of the period, anesthesia was introduced. In 1844 Horace Wells, a dentist of Hartford, Conn., employed nitrous oxide successfully in dental operations, and in 1846 William T. G. Morton, another dentist, used sulphuric ether for the same purpose. Anesthesia made possible the extraction of teeth in accordance with sound surgical practices. Anesthesia, especially under nitrous oxide, was not made generally available, however, until about 1860.

Full Dentures.—During this period dentists felt that the restoration of lost teeth constituted the most essential part of dentistry. Although the use of springs for the retaining of complete dentures continued in common use throughout the early years of the 19th century, dentists of about 1800 had occasionally designed dentures that were retained by the close adaptation of the denture base to the ridges on the jaws and the palate. This type of retention, in order to be successful, required 'better-fitting' base plates than those carved from ivory and hippopotamus tooth, and it also needed greater extension over the ridges and the hard palate.

At the close of the 18th century dentists had begun to take impressions of the mouth as

a standard procedure in the designing of dentures, and had begun to make casts and dies duplicating the form of the oral structures on which the bases of the dentures were to rest. First wax, and after 1844 plaster of Paris, was used for this purpose; and near the middle of the century a mixture of various materials capable of producing a moldable substance came into use. It was called modeling compound.

The new retention required the use of a base plate material that could be molded or swedged to the form desired. The porcelain employed for dentures at the close of the 18th century was moldable to any shape before it was baked. Malleable gold plate, swedged on a die by means of a counterdie, was also capable of giving a fairly close fit. Neither porcelain nor gold plate was entirely satisfactory. But by means of this nearly exact duplication of the superficial form of the supporting oral structures it was possible to dispense with springs and other special retention devices.

Improvements in the denture teeth were also brought about at the beginning of the century. Giuseppangelo Fonzi, an Italian dentist practicing in Paris, introduced (1804) individual porcelain denture teeth which, by means of platinum brackets baked into the teeth, were soldered with gold to a platinum base plate. Later, dentists built rose-colored jeweler's enamel about the teeth mounted in this way in order to simulate the gums. The result was a denture more natural in appearance. Improvement in denture teeth and their wider manufacture received fresh impetus from American dentists after 1830. (In England, Claudius Ash, the dental manufacturer, introduced so-called tube teeth, in which a gold post extending through the length of the tooth crown furnished a means of attachment to the base plate.)

Partial Dentures: Crowns and Bridges.—Post crowns continued in use for the restoration of single teeth, and entire dentures might be supported by a few posts in the roots of teeth. In America certain improvements were made on the French post crown, especially in the matter of retention. Often in the United States hickory pegs were used for the posts. Although they were not altogether sanitary they gave strong retention when the moisture of the mouth made them swell in the root canals into which they had been driven. Fully contoured crowns were employed in place of the "split bean" type previously used in France.

The profession also introduced partial dentures held in position by means of metal clasps fashioned from gold plate. At that time wide clasps closely adapted to a large part of the surface of the abutment tooth were thought to give the greatest retention and to be in general the most satisfactory.

Orthodontics: the Principle of Expansion.—Among the many original ideas which John Hunter had incorporated in his book on the teeth was the suggestion that a narrow dental arch could be expanded so as to accommodate all the teeth that had been crowded into it. Various French dentists adopted the notion that, instead of reducing the tooth structure to the size of the existing arch, as was the custom in the 18th century, it would be desirable to expand the arch when the teeth were crowded. The French dentist Pierre Lefoulon, who also coined the word "orthodontosy," designed a spring appliance (1841)

for the purpose of expanding the arch. It is much like the modern arch bar used by orthodontists today. Until about 1930 the expansion of the dental arch remained one of the principal aims of the orthodontist.

Theories of the Cause of Dental Caries.—Early in the 19th century more plausible theories began to replace the older farfetched notion as to the cause of dental caries. There were two main theories. One was based on the assumption that the hard substances of the teeth (enamel and dentine) were vital like the other tissues of the body and that when irritated they could become inflamed. The supporters of this vital, or inflammatory, theory believed that the inflammation began inside the tooth in the periphery of the pulp and progressed outward, causing the death of the dentine and enamel and thus producing dental decay.

The other theory postulated a chemical cause for decay. It regarded the tooth structure as passive. Food and other substances deposited on the teeth produced destructive chemicals which attacked the enamel and worked inward, finally destroying the dentine and exposing the pulp. Amos Wescott, an American dentist, demonstrated (1843) that various acids would attack the structure of extracted teeth and form cavities that were similar to those produced by dental decay.

Filling Teeth.—In the first half of the 19th century noncohesive gold foil was still considered to be the best filling material. The use of low-fusing metal alloys for filling teeth began early in the century. They were placed molten in the tooth cavity. In 1818 Louis-Nicolas Regnart, a French dentist, developed a slow-setting silver amalgam which he placed in the tooth cavity and shaped to fit by the application of a hot instrument. Amalgam containing silver and mercury was employed about 1824 in much the way in which it is used today. In the United States the better dentists were strongly opposed to the use of amalgam, which was introduced by charlatans. The amalgam of the time not only failed to make a tight filling but was thought to cause mercury poisoning. The American Society of Dental Surgeons was dissolved because of dissension concerning amalgam.

Pulp Treatment and Root Canal Filling.—Methods of filling the pulp chamber of a tooth from which the pulp had been removed were somewhat improved early in the 19th century. Particularly, an effort was made to fill the root canals with gold foil all the way to the openings at the canal ends.

There was, however, theoretical objection to removing pulps and filling the "natural cavity" of the tooth. Leonard Koecker contended that, since the tooth was kept alive by the dental pulp, the tooth became dead when the pulp was removed and therefore as a foreign body it irritated and finally destroyed all the living tissue with which it was in contact. Other dentists believed that the root was nourished by the membrane which lined the socket as well as by the pulp and therefore, if the crown of the pulpless tooth was removed, the root could be retained as a living body on which to mount an artificial crown.

As long as cautery and mechanical injury were employed to destroy the pulp, the operation was too painful to allow of its frequent use. But with the introduction (1836) of not too painful method of destroying the pulp by the application of a

small amount of arsenic trioxide, the removal of pulps, in spite of theoretical objections, became quite common.

Periodontal Disease.—The diseases of the supporting structures of the teeth—the gums, bone, and suspensory ligament and membrane about the tooth—received little attention before the 19th century. Early in that century two types of periodontal disease were recognized. One, the most frequent, was ascribed to irritation and inflammation of the gums caused by deposits on the teeth. The other, consisting of only about 10 per cent of the cases, was ascribed to obscure systemic conditions. In America for many years deposits on the teeth were thought to be the sole cause of periodontal disease, and since they could be removed, the prognosis of the disease, in contrast to the pessimism concerning it in the 18th century, was very favorable. Leonard Koecker did much to establish this optimistic point of view.

TECHNICAL AND SCIENTIFIC PROGRESS SINCE 1850

Cause of Dental Caries.—From 1880 to 1890 Wiloughby D. Miller investigated the relation of microorganisms to the production of dental caries. He demonstrated, in his *Microorganisms of the Human Mouth* (1890), that the process of decay is brought about by the dissolving of the inorganic salts in the tooth's substance by acid produced when bacteria are present. J. Leon Williams and Greene V. Black in about 1903 supplemented this theory by showing that the decay took place at locations where there were bacterial plaques on the teeth. Several research workers since 1936 have helped to prove that the acid which dissolves the tooth's substance is produced by the action of enzymes (produced by bacteria) on carbohydrate substances, and especially on sugar. Lactic acid is rapidly formed and is concentrated in the plaques where decay begins.

Fillings and Filling Materials.—G. V. Black extended and systematized the procedures followed in preparing cavities for filling. In 1891 he set forth the principle of "extension for prevention." According to this principle the margins of all cavities were placed in self-cleansing areas of the tooth's surface to prevent a recurrence of decay.

At the middle of the 19th century, gold foil, employed as a nonwelding material and wedged between opposite walls of the cavity, was the universally preferred material for filling teeth. In 1853 a new form of gold, chemically prepared and called sponge or crystal gold, was introduced. It was supposed to be pure gold and to weld in the cavity upon pressure of the plugger—a result which was not accomplished, as time was to prove. In 1855 Robert Arthur, a distinguished American dentist, discovered that gold foil, upon being freshly annealed, would cohere under pressure. He proposed the making of fillings by this cohesive method. Unlike noncohesive gold, cohesive gold could not be put in place if moisture was present. After S. C. Barnum introduced the rubber dam (1864) and the saliva pump was perfected (1874), the problem of keeping the cavity dry was solved. In 1869 G. V. Black explained the principle of cohesion and recommended means for keeping the surface of the gold free from contamination by harmful gases. Because cohesive gold could be built beyond the cavity walls to restore the contour of the tooth, it largely superseded noncohesive gold after 1870.

Through the efforts of J. Foster Flagg, amalgam was somewhat improved (1877) and attained a better reputation in the profession. T. B. Hitchcock and Edward A. Bogue proved (1874) that the charge that amalgam had a harmful effect upon the mouths of patients had no basis. G. V. Black developed (1895) an amalgam that neither expanded nor shrank upon setting. Thenceforth, amalgam became a thoroughly reputable filling material.

In 1907 William H. Taggart introduced a practicable method of casting gold inlays under pressure. The gold inlay has largely superseded the cohesive gold filling. Many years have been required to perfect the casting process so that the casting shrinkage of gold can be compensated for and the inlay become a satisfactory means of restoration. The inlay has been even more effective in furnishing a means of retention for dental bridges.

Acrylic resins (plastics) have been employed to some extent for inlays, and since about 1945 self-curing plastics that harden in the mouth have been experimented with as filling materials.

Pulp Treatment and Focal Infection.—About 1880 it was discovered that inflammation and suppuration of the dental pulp is caused by infection through exposure of the pulp by decay. This discovery nullified the theoretical objection to the removal of diseased pulps and the filling of the pulp chamber and root canal. Improvement in the methods of devitalizing pulps by the use of cocaine (about 1890) and by the use of procaine (about 1905) encouraged the practice of removing pulps.

After 1910 the dental profession came to be much concerned over the harmful systemic effects of infections located at the root ends of teeth. In accordance with the theory of focal infection developed by Frank Billings, a distinguished medical practitioner, and others, arthritis, heart conditions, and gastrointestinal complaints were ascribed to local foci of infection, such as dental abscesses. As a result many dentists and physicians began condemning all pulpless teeth and insisting that, unless the pulp could be saved, the tooth should be extracted. The specific effects of localized infections on the general health have since been called into question, and as a result pulpless teeth have generally been retained when the patient's condition permitted.

Dentures.—The search for a moldable base plate material resulted in the adoption (about 1860) of vulcanized rubber for that purpose. But acrylic resin, a synthetic plastic introduced in about 1937, gave a more lifelike appearance and in a few years largely superseded vulcanite as a base plate material.

Before the middle of the 19th century retention by close adaptation to the tissues had superseded retention by springs, and the base plate consequently was extended over the palate and furnished with deep flanges over the ridges.

In the construction of complete dentures (supplying all the teeth), it was found necessary to relate casts of the upper and lower jaws in such a way as to duplicate the relations of the jaws when stationary and when chewing. To accomplish this a mechanical device was introduced (1840) on which the casts were mounted. The notion that this device should duplicate the relations of the jaws in all respects was advanced by W. G. Bonwill, who designed (1864) what he considered to be an "anatomical" articu-

lator. Improvements in the functioning of the articulator were accomplished in various articulators invented throughout the century. The articulator invented by Alfred Gysi of Switzerland (about 1910) and that of R. L. Hanau, a mechanical engineer (about 1922), gave great adaptability. The high degree of functional performance of the modern denture owes much to the articulator.

Denture teeth were greatly improved in the 20th century. Front teeth designed to harmonize with the various facial types were designed by J. Leon Williams (1914), and an improved anatomical form for the chewing surfaces of the back teeth was the work of Gysi (1910). About 1928 various designs for back teeth in dentures began to give greater mechanical advantage on the chewing surfaces than teeth of natural form could afford. These were called nonanatomic teeth.

Dentures which are constructed before the last remaining teeth in the mouth are extracted and which are inserted directly after the teeth are removed were introduced about 1925. These dentures were referred to as "immediate."

Periodontal Disease.—For the treatment of disease of the supporting tissues of the teeth J. M. Riggs (about 1865) introduced a severe form of subgingival surgery (scraping within the tooth socket). The disease became known, in the United States particularly, as Riggs' disease.

After 1880 numerous theories were advanced as to the cause of periodontal disease. About 1915 microorganisms, and especially an amoeba of the mouth, was thought to be the cause, and emetin was used in treatment. In 1917, P. R. Stillman emphasized the importance of injury to the teeth as a result of wrongly directed heavy pressures of opposing teeth, which he called "traumatic occlusion." The adjustment of the occlusion by grinding certain teeth and by restoring the chewing surfaces of others has become a standard method of treatment. Scaling the roots of the teeth (removing the calculus or hard deposits) and surgically trimming diseased gums (gingivectomy) to remove the "pocket" have also been generally employed.

The term "scorbutus of the gums," commonly used, was superseded by the term "pyorrhea alveolaris" in the United States after 1885, and earlier than that in France and Germany. After 1920 knowledge of the disease was greatly advanced by the microscopic study of diseased periodontal tissue. The Austrian B. Gottlieb, especially, contributed to this knowledge.

Crowns and Bridges.—Numerous variations and improvements in the post crown were devised from 1850 to 1950. Among other types of crowns that were also developed was the Morrison gold shell crown (1869). It became a common means of restoring back teeth and of attaching fixed bridges to abutment teeth, but in the first half of the 20th century was superseded largely by the inlay and other forms of crown. The porcelain jacket crown, devised by C. H. Land (about 1900), was perfected by others (about 1916). It has been widely used because of its satisfactory appearance.

With the development of inlays in the 20th century, the so-called fixed-removable bridges, supported at one end by an unattached spur resting on a gold inlay, was more often employed than the fixed bridge. In order to allow functional movement of the teeth supporting the

bridge and to prevent harmful thrusts upon them, numerous types of removable bridge with so-called precision attachments were devised. Cast clasps with stops to prevent movement of the clasp on the tooth's surface were designed to rest in contact with the tooth at restricted areas. Such an arrangement prevented injury to the tooth.

Orthodontics.—In the latter part of the 19th century orthodontists came to put increasing emphasis on the importance of achieving a satisfactory occlusion, that is, they recognized that the teeth of the lower jaw must fit properly against those on the upper jaw. Normal occlusion was the objective. The greatest influence upon orthodontic thinking was the work of Edward H. Angle, who defined occlusion, introduced a fundamental classification of malocclusions, and devised, successively, several systematic types of appliance for the treatment of malocclusion.

Since Angle's death (1930) the notion of occlusion has been developed into a less rigid conception. We now know that not only the relation of upper and lower teeth to each other is involved, but also the relation of the teeth to the whole head. The cephalometer, a positioning device for the patient in X-ray photography of the head, devised (1931) by B. Holly Broadbent, has greatly facilitated the study of growth and development in the jaws and face.

20th Century Technical Advances.—The second quarter of the 20th century saw many technical advances in dentistry. They included improvements in instruments (such as the introduction of diamond stones and carbide burs), the development of various new dental materials (such as hard gold alloys and other alloys with advantageous physical properties), new methods of studying dental tissues and materials (such as the use of electron microscope and radioisotope tracer elements), and many other innovations.

PROFESSIONAL DEVELOPMENTS SINCE 1850

England.—Although English dentists had for some time aspired to establish their art as a recognized profession, it was not until 1855 that definite steps were taken to achieve their end. In that year Samuel Lee Rymer in a published letter called for the establishment of a college of dental surgery independent of the surgical profession. This appeal resulted in the formation of the College of Dentists in 1857. The dental profession was at that time divided into two groups. One group (referred to as the Memorialists) wanted to win the sanction of the Royal College of Surgeons. The other group was in favor of independent education and organization.

The Memorialists organized the Odontological Society of London in 1857, and established the London School of Dentistry in 1858. On the other side, the College of Dentists established the National Dental Hospital in 1861. The Memorialists appealed again to the College of Surgeons in 1859, and upon the granting of a new charter to the College of Surgeons, together with an enabling amendment, the latter body took over the examination and certification of dental applicants. The first examinations were held and the first certificates granted in 1860. The split between the two factions of dentists was finally healed by the dissolution (1863) of the College of Dentists and the inclusion of its members in the Odontological Society, which ultimately (1907)

became the Odontological Section of the Royal Society of Medicine.

The Dentists' Act of 1878 established the Licentiate of Dental Surgery and the Dental Register, where qualified dentists were listed. The British Dental Association was founded in 1880, and the *British Dental Journal* began publication in the same year. Failure of the Dentists' Act of 1878 to eliminate the unqualified practitioner from practice led to the adoption of the Act of 1921, which provided that only registered dentists might practice. Sir John Tomes (1815-1895), whose textbook, first published in 1848, was universally regarded as one of the greatest contributions to dental literature, was one of the chief leaders of British dentistry both in its struggle for professional advancement and in the progress of dental science.

Germany.—Somewhat similar professional developments were taking place in other countries throughout Europe. In Germany, although local societies had existed earlier, the first national organization of dentists was the Central-Verein Deutscher Zahnärzte (the Central Association of German Dentists 1859). The first dental journal (1846) was *Zahnarzt (Dentist)*, a privately owned publication. The Central-Verein began (1859) publication of a bulletin which became a journal in 1861, and ultimately, in 1883, *Die Deutsche Monatsschrift für Zahnheilkunde (The German Monthly of Dentistry)*. The University Institute for Dentistry at Berlin was established in 1884, and was rapidly followed by many other university dental schools.

In Germany two types of practitioner developed. The *Zahnarzt*, or physician-dentist, was educated at the university and was a fully qualified practitioner. The *Dentisten*, legalized in 1869, were technicians with more or less training who were originally restricted to prosthetic practice but who ultimately covered about the same field of practice as the *Zahnarzt*. By a law adopted in 1952, practice in the West Zone of Germany was restricted to the *Zahnarzt*, with the exception that *Dentisten* already in practice might continue. A similar law was enacted in the East Zone in 1949. All classes of dentists in the West Zone were united in one organization in 1953.

France.—When legal regulation of the medical arts was revived in France in 1803, the legal position of dentists remained uncertain, and to avoid trouble many practitioners found it desirable to qualify under the new law as *officier de santé* (a man allowed to practice medicine though he had no doctor's degree).

Two dental organizations were founded in 1879, the Société Syndicale Odontologique de France and the Cercle des Dentistes de Paris. The latter became the Association Générale des Dentistes de France in 1884. The École Dentaire de Paris, the first dental school, was opened in 1880, and the École Dentaire de France was established in 1884. The law of 1892 put the French dentist on a professional basis. In order to practice he had to have the diploma of a physician or of a surgeon-dentist (*chirurgien-dentiste*). To obtain the dental diploma he was obliged to pursue a prescribed course of study and undergo an examination before the medical faculty, which granted the diploma.

L'Art Dentaire, founded in 1857, was the earliest journal. *L'Odontologie* was founded by the Cercle des Dentistes in 1881, and continued as the

official publication of the Association Générale until it was discontinued in 1953.

In France, as in many other countries of Europe, a struggle went on between two parties supporting differing views as to the nature and proper education of dentists. The stomatologists—oral specialists—whose most distinguished leader was Émile Magitot, celebrated dental embryologist and pathologist, believed that the dentist should have a medical degree. The Société de Stomatologie (founded in 1887), *La Revue de Stomatologie* (begun in 1894), and L'École de Stomatologie in Paris (established in 1911) represented the stomatologists. The odontologists, whose most distinguished leader was Charles Godon, believed that dentists should be educated independently of medicine as specialists in their field. After World War II, there was no effective stomatological movement in France.

United States.—The American Society of Dental Surgeons, which was dissolved in 1856 because of a difference of opinion as to the use of amalgam, was a closed corporation of leading dentists. The Dental Convention, founded in 1855, was, on the contrary, an organization without qualifications for its membership.

An organizing convention of dentists that met in 1859 set forces in motion that led to the founding of the American Dental Association in the following year. The new association was a representative organization to which delegates from state societies and other agencies were elected. Because of the Civil War the Southern Dental Association was organized as a separate body in 1869. The profession was again united in 1897 by the merging of the two existing societies in the National Dental Association, which in 1922 again became the American Dental Association. Since 1912 the state dental societies have been the constituent organizations of the association.

The first dental school to be organized as an integral part of a university was the Harvard School of Dentistry. In 1955 there were 43 dental schools in the United States. Of these all but three were departments in universities.

Several agencies and organizations dedicated to the promotion of dental education have been established. Since 1923 the American Association of Dental Schools and since 1938 the Council on Dental Education of the American Dental Association (originally a standing committee) have been the principal guiding influences.

The requirements for entrance to dental schools have risen from a "good English education" in 1884, to one year of high school in 1898, three years of high school in 1907, a high school diploma in 1910, one year of college training in 1926, and two years of college in 1937. The dental course, beginning with two annual semesters of a few weeks each in 1840, was extended in 1917 to cover four years from the time of entrance.

As early as 1841 the state of Alabama made an unsuccessful attempt to regulate the practice of dentistry and to license the dentist. In 1868 Kentucky, New York, and Ohio enacted effective licensure legislation. State licensure was required in all the states in the Union by 1907. The National Board of Dental Examiners, a council of the American Dental Association, administers a written examination for dental graduates which is accepted in lieu of the state board's written examination in 33 of the states and in several federal agencies.

Following the *American Journal of Dental Science*, many dental journals were published in the United States, most of them by dental manufacturers or supply houses. Among the best of them was the *Dental Cosmos* (1859-1938). A strong feeling that professional journals should be under the sponsorship of the profession resulted not only in the establishment of the *Journal of the American Dental Association* in 1913, but also in the gradual establishment of state society journals, of which in 1953 there were 34. Since 1913 a number of specialized journals have appeared representing most of the specialties of dentistry. Publication of an *Index to Dental Literature*, covering all articles published in dental journals in English since 1839, was begun in 1921.

Dental hygienists, trained to clean teeth and to give instruction in dental hygiene, were first trained in a private school by A. C. Fones in 1913. In 1950 there were 16 recognized schools for hygienists, and 45 states and the District of Columbia had legalized their type of practice.

Specialization.—Several specialties in dentistry arose during the 19th and the early 20th centuries. Oral surgery and orthodontics came to be recognized as specialties in the latter part of the 19th century. Practitioners in those specialties, as well as in periodontics, pedodontics, prosthetics, oral pathology, and public health dentistry were organized in associations before the middle of the present century, and diplomates in those specialties were designated by specialty boards recognized by the American Dental Association.

Before 1911 in the United States Army and before 1912 in the Navy there were no commissioned dentists. Dentists in the military services were admitted to higher ranks during World War II.

Dental Research.—Until early in the 20th century research in the field of dental science was carried on mostly as individual investigations, but before 1920 there was a distinct trend toward the subsidizing of it by larger groups. The American Dental Association, through a research commission that granted subsidies to research projects, and a research institute (1916-1920) that carried on research, endeavored to promote scientific investigation of dental problems. The *Journal of Dental Research*, founded in 1919, and the International Association for Dental Research, in 1921, were originated by William J. Gies. Through joint sponsorship of the American Dental Association and the Federal government, dental research has been carried on since 1928 by the National Bureau of Standards and since 1948 by the National Institute for Dental Research. Dental research is also a part of the work in dental schools and institutes in the United States, England, Canada, the Scandinavian countries, Germany, Switzerland, and other European and Latin-American countries.

World Scope of Dentistry.—Associations of dentists, dental journals, and dental schools have now been established in almost every country of the world. The *Fédération Dentaire Internationale* was founded in 1901 and has met annually in times of peace. Since its founding it has sponsored international dental congresses, which are planned to meet every five years. The first International Dental Congress met in Paris in 1889, and the 11th in London in 1952. There are other international organizations, such as the

International Association for Dental Research (1921) and ARPA International (Association pour les Recherches sur les Paradentopathies), which was organized in 1932. The *International Dental Journal*, published by the *Fédération Dentaire Internationale*, was founded in 1950.

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GEORGE B. DENTON,
Research Consultant, American Dental Association.

DENTISTRY, Public Health. The dental profession and the public health profession in America have much in common. Both were born at about the same time in the early 19th century and both were developed in much the same manner. Public health dentistry, an offshoot of the two professions, began at an early age to show its relationship to its two parents. As far back as 1850 a few pioneers in the dental profession strongly advocated preventive dentistry, the forerunner of public health dentistry. But not until both dentistry and public health had attained the respectable age of more than a hundred years did their public dental health branch develop sufficiently to command serious recognition.

Public health is charged by society with the responsibility of preventing disease and promoting the health of both the individual and the community. Dentistry is charged with the responsibility of preventing and treating diseases of the mouth and teeth. By custom the dentist's service is limited to the treatment of individuals. Public health dentistry is charged with responsibility for improving the dental health of the community, a program which is carried out by the use of public health measures. Public health practices, including the practices of dental public health, may be promoted by federal, state, or local agencies or by their cooperative efforts.

Even as late as 1900 the role of dentistry in public health was somewhat obscure and illy defined. The dental needs of the great mass of citizens were beginning to be evident, but the manner of meeting those needs seemed a problem too hard to solve. Today the object of public health dentistry is far better understood. Public health authorities realize that unhealthy conditions of the mouth, particularly dental decay and periodontal disease (pyorrhea), are the most prevalent of human disorders. They recognize that such disorders are often reflected in systemic ill health, and they are conscious that specific public health measures must be instituted to combat the growing incidence of those diseases. Out of such recognition and understanding developed the modern concept of public health dentistry.

Inception of Public Health Movement.—The public health movement in the United States

is now well over 150 years old. In July 1798 Congress established the Marine Hospital Service, forerunner of the United States Public Health Service. As its name implied, the Marine Hospital Service operated hospitals for ill or injured merchant seamen. It was given the responsibility of enforcing quarantine and preventing the entry of disease from abroad. It had functioned on that limited basis for almost 100 years when Congress expanded its duties (1893) by granting it the power to control the spread of all infectious and contagious diseases and to cooperate with state and municipal health agencies in preventing the introduction and interstate spread of such diseases. In 1902 the name of this agency was changed to the Public Health and Marine Hospital Service. In 1913 its name again was changed to the United States Public Health Service, and its activities were enlarged to include "all diseases of man and conditions influencing the propagation and spread thereof."

Despite this broader concept of its responsibilities, seven more years elapsed before the United States Public Health Service established a rudimentary dental department. This it did in 1919. Since that time the dental responsibilities and activities of the Public Health Service have grown tremendously, and its personnel of dental officers had expanded to a commissioned strength of 223 as of Sept. 30, 1953.

At the turn of the 19th century, during the initial years of the public health movement in the United States, and prior to 1840, when the dental profession was born, no thought was given by the public, and little by dentists, to the contribution dentistry might make to the cause of public health. A few dentists, it is true, concerned by the dental suffering of the destitute, pioneered in the establishment of facilities for its relief. The first dental dispensary for the treatment of the poor in the United States was established in 1791 by Richard Cortland Skinner in New York City. In 1849 a dental dispensary was established by the Society of Dental Surgeons of the State of New York, and in 1861 a dental dispensary was installed with the cooperation of the dental profession at the Charity Hospital in Philadelphia.

Dental public health was taking form and shape at about the same time in Europe. In 1865, Jessen, of Strasbourg, Germany, established the first children's dental clinic, and in 1890 oral hygiene was introduced into the schools in England. Germany was the first country in Europe to establish a program of sickness insurance for industrial workers (1883). It was also the first to provide industrial workers with some type of public dental health service—which it administered through the medium of its sickness insurance scheme. Limited dental service was provided by two types of dentists: *Zahnärzte*, or formally educated dentists, and *Dentisten*, or dental technicians who had little or no formal training. Insurance dentistry constituted the principal type of public dental health service in Germany until it was disrupted by World War II. Since then the program has been reorganized in Western Germany. Of the Scandinavian countries Sweden is reported to have the most advanced plan for public dental health. Her program is devoted almost entirely to preventive dental service for school children.

Before the second quarter of the 20th century, public health dentistry in Great Britain

was limited to dental service for school children. Although the British Health Insurance Law became effective in 1911, not until 1921 was dentistry included among its provisions. Under the act of 1911 British workmen and their dependents who were insured in one of the workmen's insurance societies, or "friendly" societies, were entitled to certain limited health benefits. In 1921 a limited amount of dental service was added as an "additional" benefit. The law permitted those insurance societies that showed a surplus at the end of each five-year period to provide dental, optical, and other special health services to beneficiaries.

British Health Service Act.—This limited type of public dental health program continued in Great Britain until July 1948, when the country adopted a National Health Service Act. In the beginning, under that act, all necessary medical and dental service was provided to British citizens at government expense. The great need and popular demand for dental service soon demonstrated to the British Ministry of Health that not all types of dental service could be furnished to beneficiaries without charge. Accordingly, a number of revisions in the schedule for dental fees were instituted and charges were made for certain types of service, particularly for dentures and other major restorations. Although the National Health Service enabled more British adults to obtain dentures and to benefit from other types of restorative dentistry, the program seriously injured the preventive dental program for British children, since many school dentists left that salaried service for the more lucrative incomes that resulted from the heavy demands of adults for dental care at government expense.

American Developments in Public Dentistry.—The year 1900 is important both in the annals of public health and in the annals of dentistry in the United States. That year is important in public health because it marks the time when the efforts of that profession were expanded into new fields including infant hygiene, school health work, public health nursing, industrial hygiene, and health education. In 1900 both the Anti-Tuberculosis League and the Red Cross entered the field of public health.

Dentistry, particularly public health dentistry, looks back on the year 1900 with particular interest, since it was then that the dental profession made its first concerted effort to promote its public health activities. In that year the National Dental Association, now called the American Dental Association, appointed its first Committee on Oral Hygiene. The appointment of this committee was the natural outgrowth of the fact that by the close of the 19th century an increasing number of dentists thought and spoke in terms of dental hygiene and preventive dentistry for children. W. A. Ebersole, a dentist of Cleveland, Ohio, galvanized the thoughts of the profession into action. As chairman of the Oral Hygiene Committee of the National Dental Association he helped to inaugurate a program of dental hygiene in one of the schools of Cleveland. In 1909 he so thoroughly demonstrated the practicability of his school dental program that the resultant publicity led to the establishment of similar programs for children in other communities throughout the country.

In 1910 the Dental Society of Rochester, New York, established the Rochester Dental Clinic,

which was endowed (1915) by the late George Eastman. The Forsyth Dental Infirmary for Children was established in Boston in 1910 by the Forsyth family of that city. The Strong-Carter Dental Infirmary was founded on Aug. 18, 1920, in Honolulu, Hawaii, by Mrs. George R. Carter. In 1930 the Murry and Leonie Guggenheim Dental Clinic was founded in New York City by Mr. and Mrs. Murry Guggenheim. The Children's Fund of Michigan, created (1929) by the late United States senator James Couzens, maintained a number of dental clinics for school children in scattered communities in the state. In 1935 the Zoller Memorial Clinic was established at the University of Chicago.

Other communities, less successful in their efforts to interest philanthropists, developed school dental programs financed from public funds. In most instances those programs were initiated by the local dental society, and often they were operated gratuitously by members of the society. In some communities proponents of children's dental health programs met determined opposition. There were educators who thought that the dentists proposed to use the schools for mercenary purposes. The majority of public officials feared that the program would entail an increase in taxes. And a few dentists were apprehensive lest the program endanger private practice and become the first step toward "socialized medicine." Slowly those obstacles were overcome. By 1937 more than 300 cities of 25,000 or more population had established well-organized school dental programs. In addition, hundreds of smaller communities had established some type of dental hygiene program for their children.

Interest in public health dentistry spread slowly from the local or community level to the state level. North Carolina was the first of the states to establish (1918) a dental division in a state department of health. Ohio was the first state to appoint (1913) a dentist to a state board of health. Virginia followed Ohio (1916), and was also the second state to establish a dental division (1919) in its state department of health. At midcentury some 25 states required that a dentist be appointed to the state board of health. By 1933 dental units were operating in 12 state health departments, although five other states had discontinued their dental units because of lack of funds.

Social Security Act.—The enactment of the Social Security Act in 1935 furnished the greatest stimulus to the establishment of dental units in state departments of health, for it provided funds to finance such units. By 1954, 46 states, Washington, D.C., Hawaii, Puerto Rico, the Virgin Islands, and the Panama Canal Zone had dental units in their departments of health. Although growth in statewide dental health services was slowed down by World War II, the programs have since expanded. In 1951 there were approximately 357 budgeted positions for dentists in the various state, county, and municipal health departments in the United States, of which 134 were in state health departments.

Before 1936 the directors of dental units under state public health authorities had no choice but to devise their programs as best they could, with little or no aid from other sources. Problems of policy and administration prompted the establishment in 1937 of the American Association of Public Health Dentists. The creation of

a national organization of public health dentists helped immeasurably to bring about uniformity in objectives and in administrative practices. The American Association of Public Health Dentists initiated a movement to require state dental directors to have, in addition to their dental degree, a degree in public health. By the middle of the century graduate courses in public health leading to a Master's degree were offered by 10 of the country's universities. The American Association of Public Health Dentists was also responsible for the recognition of public health dentistry as one of the seven specialties in dentistry. The American Board of Dental Public Health, founded in 1951, establishes requirements and standards, appraises the qualifications of dentists who wish to become diplomates of the American Board of Dental Public Health, administers examinations to the applicants, and issues certificates to those who pass the examinations.

The principal activities of state, county, and municipal dental units are centered in the field of preventive dentistry for children. In fact, dentistry came into the realm of public health by way of preventive dentistry for children.

Before 1920 the dental profession's public health activities consisted largely of providing or advocating dental service to underprivileged children. By 1930 this policy had expanded to include dental educational programs for all children. The depression of the 1930's focused the attention of both the public and the profession on the dental needs of underprivileged adults. The catastrophic conditions brought about by the displacement of millions of industrial workers resulted in the development of many and various plans of dental service. Not one of the more grandiose schemes ever got beyond the discussion stage. During that period many dental societies, cooperating with state and local welfare boards, developed procedures to care for the dental needs of families on relief. Most of those plans were operated on a low-fee basis. Usually patients were referred to private practitioners by the case worker. In some communities a dental clinic was opened under the auspices of the Public Works Administration. Most of those programs disappeared under the full employment and high wages created by World War II.

That war brought about a revival of interest in industrial dental programs. Industrial dentistry, originating in the boom days of the 1920's, flourished for a few years, lay dormant during the dark days of the 1930's, and came back to life in the first half of the 1940's. The American Association of Industrial Dentists was formed in 1943. Its membership is composed of dentists employed in industry and others associated with or interested in dental health service for the industrial worker. Only a few of the industrial organizations in the United States furnish any dental service to their employees. In most instances it consists of periodic examinations of the mouth, including X-ray examinations, and of diagnostic advice. Few industrial concerns make provision for dental operative service for their workers. Although both management and labor recognize the benefits to be derived through the maintenance of good dental health among industrial workers—the reduction of absenteeism, the lowering of accident rates, and the increase in efficiency—the growth of this phase of dental

service has been slow. The National Association of Manufacturers reported in 1951 that of the 3,589 companies on its rolls only 84 provided some type of dental program for their employees.

The Association's Program.—The American Dental Association for years has maintained a forward-looking position regarding the development of public dental health programs. During the first quarter of this century the association concentrated its socioeconomic efforts on the promotion of school programs of dental service. In 1923 it established a Bureau of Dental Health Education and charged it with the responsibility of educating the public in the value of preventive dentistry and the proper hygiene of the mouth. In 1929 it appointed a dental committee to report on the cost of medical care. In 1934 it appointed a Committee on Economics and charged it with the responsibility of developing methods which would enable dentistry to extend more of its services to the low-income group. In 1938 the association appointed a special committee, known as the National Health Program Committee, to consider the recommendations of President Roosevelt's Interdepartmental Committee to Coordinate Health and Welfare Activities. As a result of the studies of the National Health Program Committee, plus the studies of several other committees of the American Dental Association, that organization concluded that three fundamental requirements are necessary for the establishment of an effective national dental health program. They are:

(1) Intensified research for the purpose of discovering the causes of dental diseases in order to make preventive measures more effective and eventually to decrease the amount of dental disease in the country.

(2) A national program of dental health education to motivate people to utilize present methods of prevention and control of dental disease.

(3) Programs for dental service, particularly for children, as the greatest amount of prevention and control can be accomplished in this age group.

In 1942 the American Dental Association established a Council on Dental Health to study the need of, and to develop plans and programs for the provision of, more adequate dental care for the public. Every state dental society and many local dental societies established similar councils or committees to cooperate with other health and educational organizations on the state and local level, just as the Council on Dental Health of the American Dental Association works with other health and educational agencies on the national level.

One of the most important contributions ever made to dental public health belongs to the century's middle years. It was the establishment of the fact that the presence of approximately 1.0 part per million of fluoride in drinking water reduces the incidence of dental decay as much as 65 per cent among children who drink such water daily. Large-scale scientific studies of the effectiveness of water fluoridation were conducted in several large communities, including Newburgh, New York; Brantford, Ontario; Grand Rapids, Michigan; Sheboygan, Wisconsin; Evanston, Illinois; and Marshall, Texas. Reports from those cities, in which the drinking water was adjusted to one part per million of fluoride, uniformly show that young children who have been drinking such water from birth have from 60 to 65 per cent fewer teeth showing decay than do children living in communities that have fluorine-free water. Since complete physical and

dental examinations of these children have not disclosed any injurious systemic effects from drinking such water, it is safe to assume that the process will soon be adopted by the majority of American communities that have a communal water supply. On April 15, 1955, approximately 20,400,000 persons in 1,061 communities were drinking controlled fluoridated water. In addition, more than 3,500,000 persons reside in areas where the water naturally contains a beneficial amount of fluorides.

Scientists also have disclosed that treating the teeth of young children with several applications of a sodium fluoride solution reduces the incidence of dental decay by as much as 40 per cent.

Recent Achievements.—The progress made in public health dentistry from 1944 to 1954 would appear to exceed the progress made in this field during the entire previous history of both the public health profession and the dental profession. However, due credit must be given to the pioneers in public health dentistry, who laid the foundation on which the recent progress has been built. During the ten years we have mentioned, researchers, in addition to giving humanity the benefits of fluoridation, continued to uncover additional evidence regarding the relationship of sugar to dental decay. Epidemiologists improved methods of determining the prevalence and incidence of such decay. Histologists and pathologists advanced a new method of measuring periodontal diseases. Public health dentists designed programs to provide dental service to children on an incremental basis, which greatly extended their preventive dental operations. Congress, acting on the advice of the dental profession, promoted dental research by passing the Dental Research Act in 1948, which provides funds for such investigations. The National Cancer Institute stimulated oral cancer research by providing grants to dental schools. The use of radioactive materials in dental research opened up vast new fields of dental investigation. Engineers perfected new high-speed instruments which reduce the time and discomfort associated with certain dental operations. Researchers discovered better anaesthetics for the elimination of pain, and other scientists furnished the profession with therapeutic agents, such as the antibiotics, which have made possible a dramatic lowering of the incidence of certain serious dental disorders. Histologists, using the electron microscope, have broadened their understanding of dental structures.

All of these developments have provided the dental profession, the public health profession, and especially the dental public health worker with new technics and materials which hold fascinating promise for further important advances in dental public health within the foreseeable future.

LON W. MORREY, D.D.S.

DENTITION, dĕn-tish'un, the arrangement of teeth in animals. Teeth are present in the mouth parts of almost all the divisions of the vertebrates, from the fishes upwards, with the exception of the birds. See also **TEETH**.

D'ENTRECASTEAUX CHANNEL, dān'trē-kās-tō', strait, separating the southern end of Brunei Island from the mainland of Tasmania, Australia.

D'ENTRECASTEAUX ISLANDS, island group in the West Pacific Ocean, lying east of New Guinea, belonging to Australia as part of the Territory of Papua. The area is about 1,200 square miles. The population (1955) was estimated to be about 33,000. The group comprises three chief islands (Goodenough, Fergusson, and Normandy), separated by narrow channels. They are named after the French admiral and explorer, Joseph Antoine Bruni, chevalier d'Entrecasteaux, who visited these waters in 1792. His name is also preserved in D'Entrecasteaux Point on the southwest coast of Western Australia and in D'Entrecasteaux Channel (q.v.). The islands contain boiling springs and other indications of volcanic action. There are several very high mountains.

DENUATION. See **EROSION**.

DENVER, **James William**, American soldier and frontiersman: b. Winchester, Va., 1817; d. Aug. 9, 1892. He removed to Cincinnati, Ohio, in 1842, where he studied for the bar. Later he removed to Missouri, where he raised a company and served as captain in the Mexican War. In 1850 he went to California where he became prominent in politics, serving as state senator, and was appointed secretary of state, and afterward was elected to the 34th Congress. Before the end of his congressional term he was appointed commissioner of Indian affairs, but resigned to accept the office of governor of the Territory of Kansas in 1857. He returned to Washington after 12 months of service leaving the territory well-organized and law-abiding. He returned to California in 1859, but soon after removed to Wilmington, Ohio. He served in the Union Army as brigadier general of volunteers during the Civil War until 1863. After the war he practiced law in Washington, D.C. General Denver, at that time governor of Kansas, suggested the name Colorado for the territory formed out of Kansas, Utah, New Mexico, and Nebraska, and the capital city of Saint Charles was renamed Denver in his honor.

DENVER, city, Colorado, capital of the state and coextensive with Denver County; port of entry, and economic, governmental and cultural center of the Rocky Mountain West; altitude 5,280 feet at the Capitol; located at the junction of the South Platte River and Cherry Creek, "where the mountains meet the plains." Approximately 12 miles to the west rise the foothills of the Rocky Mountains, beyond which the snow-capped Front Range, stretching 150 miles from Pikes Peak on the south to Longs Peak on the north, is in open view. Denver, the combined city and county, extends over an area of 66.152 square miles, is in latitude 39° 44' 53" N., longitude 104° 59' 43" W.; and is approximately 540 miles southwest of Omaha, 640 miles west of Kansas City, 514 miles southeast of Salt Lake City, 1,030 miles southwest of Chicago, 1,300 miles east of San Francisco, 745 miles north of El Paso, and 1,430 miles southeast of Seattle. It has a dry, moderate climate, with comparatively low humidity; an annual rainfall of about 14 inches, and averages annually 300 days of sunshine. The city and surrounding truck farms are supplied with ample water from Denver's municipal water system and company-owned irrigation ditches. Supple-

menting the water from the South Platte River and the numerous mountain reservoirs on the eastern slope of the Rockies, tunnels through the mountains, including the Moffat completed in 1928, and the Colorado-Big Thompson Project, which was nearing completion in 1955, will insure an adequate water supply for Denver's future growth.

Transportation.—The city is at the cross roads of motor highways, railroads, and air routes, chief of which are: Federal highways 6, 40, 85, 87, and 285. It is served by the following railroads: Denver and Rio Grande Western; Burlington, Colorado and Southern; Union Pacific; Atchison, Topeka and Santa Fe; and the Rock Island. The boring of the Moffat Tunnel under James Peak through six miles of the Continental Divide made possible a direct rail route from Denver to the Pacific coast. Airlines operating from Stapleton Airport (municipal) include: United (headquarters), Continental, Challenger, Braniff, Monarch, and Western.

Commerce and Industry.—Since Denver is the only large city within a radius of 500 miles, it has become the commercial, financial, and distributing center for the area. Among the largest industries are the Denver stockyards, including the largest feeders' sheep market in the world, extensive meat packing plants, fruit and vegetable processing plants, railroad shops, motor car assembly plants, automobile distributors, and printing and publishing plants and it enjoys a large all-season tourist business including many conventions. Denver is the headquarters for large insurance firms; companies manufacturing sugar, cement, and petroleum products; and those mining coal and metal ores. Dairying, poultry raising, and the production of many crops such as sugar beets and celery, are carried on extensively in adjacent areas. Denver-grown carnations are internationally known.

Government.—The city, and Denver County, legalized in 1912, are governed by a mayor and a city council. Unusual features are the juvenile court, founded by Judge Ben Lindsey in 1901, and the department of health and charity, supplemented by the voluntary community chest organization, the first of its kind in the United States. Because of the many permanent administrative offices of the federal government located in the city and its immediate vicinity, it is sometimes referred to as the second capital of the United States.

Education.—Among Denver's educational and cultural facilities are a modern public school system, including the famous Opportunity School for adults, and the Boettcher School for Crippled Children. There are also private and parochial schools, commercial and vocational private schools, the University of Denver, Regis College (Catholic) for men, Loretto Heights College (Catholic) for women, the University of Colorado Medical School, Colorado Woman's College (Junior), the Iliff School of Theology (Methodist), the Lamont School of Music (a part of the University of Denver), and the Westminster Law School. Noteworthy also are the Denver Public Library (including the western history collection and the science and engineering department); Denver Art Museum, with its outstanding Indian art collection and its branch, Chappell House; the Colorado State Historical Museum, and the Denver Mu-

seum of Natural History (famous for its artistic and accurate habitat groupings). The city has an outstanding civic symphony orchestra and other musical and art organizations.

Parks and Recreational Facilities.—Denver is a recreational center with extensive winter sports to supplement the great influx of summer vacationists. The city is well supplied with parks, playgrounds, and recreation centers.

Denver has developed a mountain parks system comprising 15,000 acres of deeded land and 6,400 acres under lease, including Winter Park, Happy Canyon and Daniel's Park, Turkey, Deer, and Elk Creek canyons, Bergen Park, Park of the Red Rocks in which a natural amphitheater has a seating capacity of 10,000, Genesee Mountain and Park, and Summit Lake Park, all readily accessible by automobile. A road up Mount Evans leads to a high altitude laboratory operated by the University of Denver and co-operating institutions, for the study of atomic rays and other scientific matters. On the summit of Lookout Mountain, a short drive from Denver, is the grave of William Frederick Cody (q.v.) (Buffalo Bill), and museum of Cody relics. The National Western Stock Show, held annually in the Denver Union Stockyards Stadium, attracts national attendance. Denver is the gateway to national parks, with Rocky Mountain National Park 80 miles to the northwest and Mesa Verde situated in the southwest corner of the state.

Notable Buildings.—Denver has many attractive buildings which average from about four to eight stories. The state capitol, a massive structure in classical style, built of Colorado granite in 1890–1896, at an original cost of about \$3,000,000, is on an eminence in a 15-acre landscaped plateau. The City and County Building, classical in design, with halls lined with Colorado travertine marble, was completed in 1932 at a cost of \$5,000,000; and the municipal auditorium, which seats about 10,000 persons, was built for the Democratic National Convention of 1908. Civic Center, envisioned by Mayor Robert W. Speer in 1904, includes the City and County Building, the public library, the Greek Theater, the Voorhies Memorial arch, and many interesting statues. Federal buildings of importance are the United States Post Office, the United States Mint, the Federal Reserve Bank (branch), Old Customhouse, and New Customhouse. Another landmark is the Daniels and Fisher's Tower, 330 feet high, an adaptation of the campanile in Venice. On the University of Denver's campus the Mary Reed Library and other buildings are of architectural interest; the university in 1949 began construction at Civic Center, a modern building for its downtown schools. Denver has many historic landmarks including old brownstone mansions built during the days of bonanza kings; the old Windsor Hotel, with its H.A.W. Tabor suite; the Brown Palace Hotel; the Tabor Grand Opera House (Romanesque); and Eugene Field's old home, now a branch library.

History.—Denver, less than a century old, evolved from the pioneer settlements where the gold prospectors outfitted before going into the mountains. In 1850 a party of Cherokee Indians bound for California found gold in Ralston Creek near the site of what later became Denver. This discovery led to the organization of the Cherokee-Georgia prospecting party which,

under the leadership of William Green Russell, made similar discoveries in the vicinity in July 1858, and established a camp near the mouth of Cherry Creek. Soon other gold seekers arrived, and within a few months rival settlements sprang up on both sides of the creek near its juncture with the South Platte River. The settlements were augmented in the spring of 1859 by the arrival of others. Stagecoach service was inaugurated in May of that year between Leavenworth and Denver. In December the three local settlements were incorporated as Denver, Auraria, and Highland by the provisional legislature of the newly created Jefferson Territory (see JEFFERSON, STATE OF). On April 5, 1860 they united under the name of Denver. Upon the creation of Colorado Territory in 1861, the municipality was rechartered as Denver City.

The Civil War tended to cut off the new settlement from the rest of the country; but Denver remained loyal to the Union and furnished the majority of the troops who turned back the Confederates at the Battle of La Glorieta Pass in 1862. The city was swept by fire in 1863 and by a severe flood in 1864. In 1868, the territorial seat of government was transferred to Denver from Golden. By 1870, the population was 4,759, which increased to 34,555 by 1880. In June of the former year railway service was inaugurated by the Denver Pacific Railroad between Denver and Cheyenne, connecting at the latter point with the Union Pacific Railroad. Soon thereafter Denver became a terminus of the Kansas Pacific Railroad also, and by 1872 it was served by four railroads. Following the discovery of rich deposits of silver at Leadville and elsewhere toward the end of the decade, the city entered upon an era of even more rapid growth. Later, during the days of grazing on the open plains, Denver was enriched by the cattle industry. Next, it adapted itself to scientific, irrigated agriculture, stock breeding, and commercial pursuits. With the influx of population during and after World War II, Denver expanded physically by annexing suburbs which sought the city's greater facilities, including police, fire, and other protection.

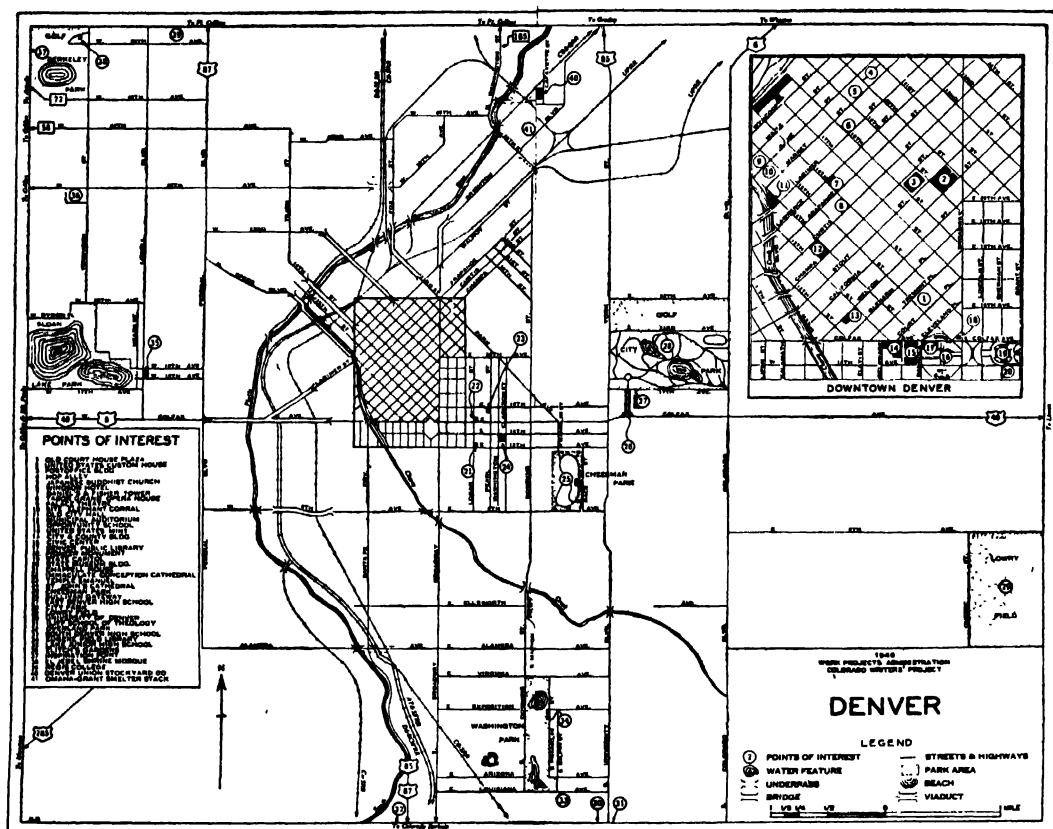
Pop. (1940) 322,412; (1950) 415,786; the population of the metropolitan district (1950) was 563,832.

Consult Smiley, Jerome C., *History of Denver* (Denver 1901); Colorado Writers' Project, *Colorado: A Guide to the Highest State* (New York 1941).

LEVETTE J. DAVIDSON,
Professor of English, University of Denver.

DENVER AND RIO GRANDE WESTERN RAILROAD COMPANY, The. The Rio Grande Railroad, as the system is popularly known, operates 2,413 miles of line in the states of Colorado, Utah, and New Mexico, including 550 miles of narrow (3-foot) gauge lines, and 50 miles of 3-rail trackage on which both standard and narrow gauge equipment is operated.

The present system is the outgrowth, through reorganizations, of the old Denver and Rio Grande Railroad, incorporated in 1870, originally projected from Denver south and southwesterly to the Rio Grande River, thence to El Paso, Texas, and on to Mexico City. Extensive development of metal mines in the late 1870's and early 1880's in the mountains of Colorado and Utah shifted the projected lines



westward, including the construction to Salt Lake City and Ogden, Utah, by the Rio Grande Western Railway, through which company most of the lines in Utah were constructed or acquired, the two being combined in 1908.

Most of the original lines were constructed narrow gauge, and except for such narrow gauge lines as still remain in mountainous and light traffic territory, were converted to standard gauge in 1890.

Reduced revenues in the depression following 1929 resulted in bankruptcy proceedings and appointment of trustees as of Nov. 1, 1935, culminating in reorganization on April 11, 1947, which involved consolidation of previously leased lines and merger of The Denver and Salt Lake Railway (Moffat Road) and The Denver and Salt Lake Western Railroad Company (Dotsero Cutoff) into the reorganized Rio Grande. Upon completion of construction of the Dotsero Cutoff in 1934, connecting the Moffat Road with Rio Grande by use of the Moffat Road including the Moffat Tunnel, a new route was provided between Denver and Salt Lake City, 175 miles shorter than the old route through Pueblo and the Royal Gorge, improving the opportunity for use of the Denver gateway for movement of transcontinental traffic to and from the Pacific coast area, interchanged with the Chicago and St. Louis lines terminating at Denver, and the California lines at Salt Lake City and Ogden, and without impairing the use of the Pueblo gateway on similar traffic.

Under the trusteeship, large sums were expended in rehabilitating and improving the physical property, and for new equipment, and the property emerged from the trusteeship in the best physical condition of its history. Main track mileage, 570 miles Denver to Salt Lake City via the Moffat Tunnel, 745 miles via the Royal Gorge, is all protected by centralized traffic control or automatic block signals. Main line operations are being rapidly converted from coal to Diesel power, and substantially more than half the present traffic, both freight and passenger, is being carried by Diesel locomotives.

A substantial revision of the financial structure under the reorganization reducing funded debt and fixed charges, steadily increasing development of agricultural, mining, and industrial activity in its own territory and the postwar (World War II) acquisition and operation of the war-born Geneva Steel Plant in Utah by United States Steel providing the company with substantial new traffic, has materially improved the position of the Rio Grande in the western railroad picture.

DENVER, University of, the pioneer school of higher learning in Colorado; founded in 1864 as the Colorado Seminary and reorganized in 1880 under its present name. The university's organization includes the graduate college; colleges of arts and sciences, business administration, engineering, and law; a junior college; schools of aeronautics, architecture and

planning, art, education, hotel and restaurant management, librarianship, music, nursing, public administration, speech, social work, and theater; bureaus of business and social research, educational research, industrial research, physical and biological science research, and research in humanities and social development; High Altitude Laboratory; Chamberlin Observatory; Social Science Foundation; Teaching Institute of Economics; Center for Latin American Studies. The university is coeducational and nonsectarian, but related to the Methodist Church. In 1950, the physical plant was valued at \$10,280,758 with an additional \$1,500,000 in gifts and appropriations available for capital purposes. The endowment totals approximately \$2,500,000. In 1950-1951 the enrollment totaled 6,313 during the academic year.

DEODAND, dē'ō-dānd (*Deo dandum*, a thing to be given or dedicated to God), an obsolete legal term for anything that had directly caused a person's death, all such chattels being, by the old rule of the common law of England, forfeited to the king, to be devoted by him to pious uses, though often finding way to his privy purse. In all indictments for homicide, the grand jury specified the instrument that immediately caused the death, and its value, that the king might claim the deodand and distribute it "to appease God's wrath." Though these forfeitures were originally incurred to the king, yet they were frequently granted to the lord of the manor or territory upon which the death happened. Deodands were abolished in 1846. There has never been anything analogous to this custom in the United States.

DEODAR, dē-ō-dār' ("divine tree," from the Sanskrit *devadaru*), a tree (*Cedrus deodara*), a native of the mountains of India, where it grows to the height of 100 feet and upward. It chiefly resembles the cedar of Lebanon in habit of growth and is probably a species of the same genus. The timber is among the most valuable grown in India. The name is rather freely applied to trees, especially to species of the Coniferae. See also CEDAR.

DEODORIZER, a substance used for absorbing foul-smelling gases, or for substituting an odor which is pleasing for one that is disagreeable. Deodorizers are not disinfectants or antiseptics, and should not be confounded with them. They are of no use save to cover up disagreeable smells, and often do a great deal of harm by shutting people's nostrils to real signs of danger.

DEOGHAR, dē'ō-gār, town, India, in eastern Bihar Province in the northeastern part of the Indian Union, 170 miles northwest of Calcutta. Rice, corn, barley, oilseeds, rape and mustard are crops of the area. Coal is mined nearby. A notable site is the temple of the Hindu god, Siva. Pop. (1941) 19,792.

D'EON DE BEAUMONT. See EON DE BEAUMONT, CHARLES.

DEPARTMENT, the name given certain territorial divisions of countries, especially to the principal territorial divisions of France. At the time of the French Revolution, when the

former division of the kingdom into provinces was abolished and succeeded by a division of it into departments, this division was determined partly by the number of inhabitants, partly by extent of territory and partly by the amount of direct taxes. The new division was proposed in the Constituent Assembly in 1789 and effected in 1790. The whole kingdom was at first divided into 83 departments, which were subsequently increased by the gradual extension of the empire to 130, and were reduced by the Peace of 1814 to 86. By the cession of Savoy and Nice to France in 1860 the number was increased to 89, and by the cession of Alsace-Lorraine to Germany in 1871 was reduced to 87. The return of the latter in 1919 again raised the number to 89. At the head of each is a prefect, appointed by the president of the republic, and assisted by a *conseil de préfecture*. Most of the states of South America are also divided into departments (*departimentos*), but these resemble the French ones in nothing but name. Each French department is subdivided into *arrondissements*, these into *cantons*, and these into *communes*. The name is applied to military divisions and various other divisions, as of government and schools.

DEPARTMENT STORES. The 1860's—particularly the latter years of that decade—opened a new chapter in the history of merchandising with the evolution of the department store. That it was truly an evolution and not a sudden discovery of a better way to sell goods is evidenced by the fact that most of the great modern department stores had their beginnings in modest general stores or small dry goods establishments.

Although Thomas Costain in his novel *The Moneyman* describes a "department store" in France as early as 1450, which was subjected to such veritable plagues of shoplifters that spies had to be set to watch the customers through slits in the walls, it is not likely that this actually resembled the department stores of the 20th century. Especially as the account goes on to tell how, when a theft was discovered, bells rang, the store's doors were locked, and all customers had to submit to being searched. It would certainly not be a popular proceeding in this century, nor one calculated to bring a store the good will considered so necessary by more enlightened standards.

The many changes which followed the ending of the War Between the States in America contributed directly to the new concept of retailing: the rapid growth of large population centers, better transportation—both to and from suburban towns and within the city itself—and the harnessing of electricity for power and lighting.

The department store is a child of the machine age. No one could conceive of its functioning without such vital aids as telephones, elevators and escalators, typewriters, comptometers, billing machines, and all the other complicated equipment required in doing "big business" as we know it; or without the brilliance of modern lighting for sales-inducing displays of merchandise in windows and showcases.

A large department store contains literally scores of separate departments, each with its special type of merchandise just as an individual shop would have, each with its manager (buyer) and expense budget, yet all united under a common ownership and operating policy.

Pyramids.—Although the set-up varies with different stores, in most cases this consists of four major divisions often referred to as "pyramids": *merchandising*; the *controller's* division (accounting); *publicity*; and *service*. In some stores the *personnel* department is considered as a fifth pyramid; otherwise it comes under *service*.

These four pyramids are further subdivided under divisional managers to include certain groupings of individual departments; but as the line-up varies drastically from store to store, it would be impossible to itemize them here to convey a typical picture. In most stores the two largest of these merchandise divisions are *ready-to-wear* and *home furnishings*.

The *controller's* division includes accounts receivable, accounts payable, audit, payroll, budgets, etc.

Publicity covers all types of sales promotion: newspaper and magazine advertising, direct mail, radio and television, public relations, and the display department.

Service is responsible for maintenance, delivery, warehouses, workrooms, etc., plus the *personnel* department. The last named is, in turn, subdivided into *employment*, *training*, and *welfare*.

For reasons of space, we are dealing here only with the true department store, and are not including the allied subjects of specialty shops and chain stores. Of these three phases of retailing, it is the department store which is indigenous to the city, needing large, closely massed populations from which to draw its customers. It must be conveniently easy of access, hence is also dependent upon good transportation facilities.

Branch Stores.—In line with this dependence upon adequate transportation, a new development in department store merchandising came into being around 1930, with the opening of the small branch store in suburban areas adjacent to the city in which the parent store is located.

Among the earliest pioneers in this movement was Strawbridge & Clothier in Philadelphia, whose first branch store opened at Ardmore in 1930, and was followed the next year by one in Jenkintown. In the fall of 1952 its third, and largest, branch store was completed just outside Wilmington, Delaware.

It seems pertinent to quote here from a speech by Dwight G. Perkins, president of Strawbridge & Clothier, made at the time the cornerstone of this Wilmington branch was laid, for it explains clearly the causes back of the trend to suburban shopping:

"In 1930, our wise management foresaw that the era of automobiles would modify customer buying habits. The ever increasing congestion of city traffic and difficulties of parking convinced them that there was a need for locating stores in communities that would offer greater shopping convenience; and thus branch stores in the Philadelphia area were inaugurated by Strawbridge & Clothier—at Ardmore in 1930 and at Jenkintown in 1931—making possible the convenient shopping practice of *drive, park, shop, and take it with you.*"

In the slightly more than two decades since 1930, the successful employment of branch-store merchandising has spread to cities in all parts of the United States.

The branch store, located in convenient suburban areas, is not, however, to be confused with resort shops which have been operated by many

large specialty shops even prior to the advent of the suburban branch. The specialty shop—often of almost department store stature—differs from the latter in many major respects: one of these important differences being that specialty shops do not carry home furnishing departments. As a rule, they concentrate on ready-to-wear and accessories, and have found it profitable to conduct small shops in fashion resorts and college towns situated at long distances from the parent establishment and catering to a limited-season trade. Their place in the retail picture has nothing to do with city traffic and parking problems which have brought the nearby branch store into existence for the customer's convenience.

Department managers in the branch store do not select from the main store's stocks, but buy directly in the market such items as they have found are particularly adapted to the suburban trade. Serving as they do a smaller, more unified shopping group than do the main city stores, the branches are able to carry more specialized inventories, based on the known buying habits and preferences of their customers.

Facilities and Activities.—The department store is literally a community within itself, with a population of from 3,000 to 5,000—figures that in many cases will rise as high as 7,000 to 8,000 at peak shopping seasons. It has its own police force (known as the *protection department*); its own hospital (medical room) with a doctor and nurses on duty during store hours; its theater (auditorium) where fashion shows, musicals, flower shows, lectures, and many important civic events are held for the benefit of customers and employees; and one or more restaurants, including an employees' cafeteria. It has its own post-office, Western Union office, travel bureau, beauty salon, and often its own bank. It stages its own drives for Red Cross, Community Chest, Salvation Army, etc., and the store president and members of the board of directors usually hold important advisory posts with civic organizations in the city.

The store even publishes its own paper for the employees—either a weekly newspaper or a monthly magazine—with an editor, assistant editor, and a corps of reporters from the different departments, to gather news and report on store events. Many stores have a fine chorus or dra-

FIGURES FOR 21 LEADING CITIES IN U.S.

Department Stores—Standard Metropolitan Areas, 1948

	Stores (number)	Sales, entire year (thousand dollars)
Baltimore, Md.	24	\$ 202,394
Boston, Mass.	53	294,518
Buffalo, N. Y.	23	116,863
Chicago, Ill.	83	1,076,677
Cincinnati, Ohio	12	111,513
Cleveland, Ohio	15	213,125
Detroit, Mich.	35	362,629
Indianapolis, Ind.	7	98,044
Kansas City, Mo.	13	183,115
Los Angeles, Calif.	62	479,890
Milwaukee, Wis.	12	143,455
Minneapolis-St. Paul, Minn.	13	258,456
New Orleans, La.	11	73,593
New York-Northeastern New Jersey	77	934,801
Philadelphia, Pa.	27	453,032
Pittsburgh, Pa.	27	254,192
Rochester, N. Y.	6	60,716
St. Louis, Mo.	15	182,199
San Francisco-Oakland, Calif.	33	245,797
Seattle, Wash.	9	120,701
Washington, D.C.	18	171,355

matic club which gives public performances several times a year; and the younger employees have their athletic teams—baseball, basketball, bowling—and compete with outside groups.

Certainly the department store of the 20th century has a valued place in the business and civic life of its home city; a place which yearly becomes more and more important as the scope of its activities increases.

Careers in the Department Store.—Men and women without specialized training have always fitted into positions on its selling force and into such departments as receiving and marking, packing, and mail order; but with the new growth of the store it now offers opportunities for worthwhile careers to young college graduates also. There are fine schools of retailing connected with many of our universities; at Washington University in St. Louis, at the University of Pittsburgh, and at New York University, as well as the Prince School of Boston which is connected with Simmons College—to mention only a few outstanding names in this field. The retailing courses conducted by these schools offer their students opportunities to acquire practical experience in part-time jobs with department stores during the year, in addition to the regular class work.

It is often surprising to persons unfamiliar with retailing to learn that the nonselling positions in a department store considerably outnumber the selling ones. (It was pointed out in World War II how many workers at home were required to keep one soldier in the field.) It is this wide variety of opportunities for specialization that makes a department store career beckon invitingly to ambitious young men and women.

For those interested in creative writing, there is the copy writer's job in the advertising department, writing to be done for the store's radio and television publicity, and the store publications to edit. The public relations director needs alert young assistants to help prepare newspaper releases, and to give talks at club meetings and schools; fashion artists and layout people must illustrate copy for newspaper ads and direct-mail pieces; the fashion department has many openings for young women who can put on fashion shows and select the proper clothes and accessories for the models; college shops use advisers on what is being worn on the campuses of the country, and many stores have teen-age clubs for which they must have young, enthusiastic directors. There is, too, at least one poised, mature woman in each department store whose duties are to cooperate with the many women's and garden clubs which hold their meetings in the store's auditorium and for whom fashion shows are constantly being arranged.

Girls interested in travel find a job in the travel bureau stimulating; restaurants and cafeteria must have trained dietitians, hostesses and managers; and the legal department often employs a young lawyer as assistant to the company counsel. Good secretaries are always in demand for the department heads and executives—secretarial jobs that can lead to excellent promotions in the organization. And there are scores of openings in the accounting departments for men and women who enjoy working with figures.

Famous Early Department Stores.—There have been many claims as to which was actually the first department store to emerge from the "general" stores and dry goods establishments of

the earlier period. However, this is a controversial question which seems to lack sufficient facts to settle definitely. The time was evidently ripe for the new method, and many far-seeing merchants both abroad and in the United States took advantage of it almost simultaneously.

Frank M. Mayfield, for his book *The Department Store Story* (published in 1949 by the Fairchild Publications, Inc., New York), did such careful and detailed research on famous early department stores that we are grateful to the publisher of this book for permission to reprint here some of the facts and interesting anecdotes Mr. Mayfield's researches have uncovered concerning that dramatic era in merchandising.

"... Many ... have called the Bon Marché in Paris the first department store," he writes. "However, although it existed as a dry goods store as early as 1838, it was not until the '60's that it had taken on the attributes of a full-fledged department store. It did an annual volume of \$1,400,000 in 1863 and was certainly one of the largest stores of its time.

"Printemps in Paris dates from 1865 and, from its earliest days, was departmentalized. It is still a large and unique department store; ... and does a large business all over the world, particularly with the French colonies.

"William Whiteley began a set program of adding departments about 1860 in his London store, and advertised himself under the slogan 'The Universal Provider' ...

"A. T. Stewart, an Irish immigrant, had a large store in New York, founded in 1823, which he later sold to John Wanamaker and had its name changed to that of the new owner. Long after its early days, it was claimed to be the first department store; it seems, however, to have been only a general merchandise store and did not really assume department store characteristics until the later 1860's. R. H. Macy & Co., founded in 1858, began to departmentalize about the same time.

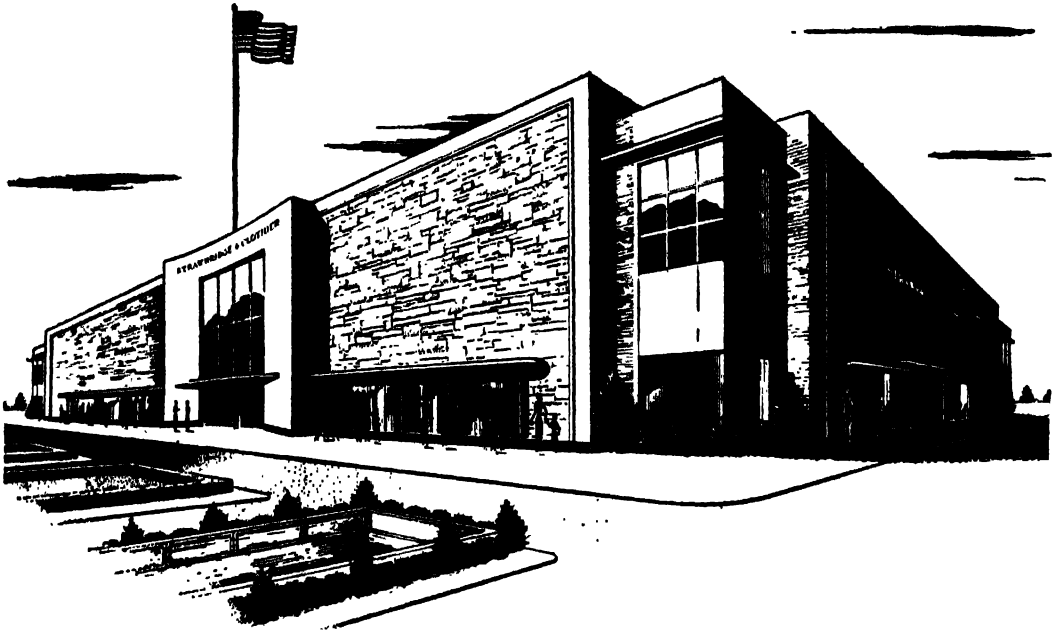
"Another store which later became departmentalized is Lord & Taylor, founded in New York in 1826.

"... Samuel Lord and George Washington Taylor operated a piece goods and women's accessory store of quality along frugal lines. One of the store rules was that anything bought for less than a dollar must be wrapped in newspaper; if the customer paid more than a dollar, the article was done up in store paper, 'which,' it is recorded, 'was very acceptable to the housewives as they used it for shelving purposes.'

"D. H. Holmes Company of New Orleans was founded in 1842. It was the first store—at least in the South—to use women clerks. This was at the time of the Civil War when there was a great shortage of manpower. ...

"The White House, in San Francisco, ... was established in 1854, when San Francisco was a gold mining town. It was, of course, a small shop when its owners hired Raphael Weill, a young French boy of 18, because there were so many Frenchmen in San Francisco that '*Ici on parle Français*' on the window was a good business getter. The store became a great department store and Raphael a great connoisseur, a great citizen and philanthropist. ... The White House claims to have run the first full-page ad ever run by a department store. ...

"The City of Paris, in San Francisco, is a unique store. It dates from 1850, when a French-



Strawbridge & Clothier's largest and newest branch store in the Metropolitan Merchandise Mart just outside Wilmington, Delaware.

man named Felix Verdier sailed into San Francisco Bay with a chartered brig bearing silks, laces, fine wines, and other products of France and sold them from the deck of the vessel. He moved ashore, started a store still called the City of Paris and still strongly French in its atmosphere. . . .

"Arthur Letts was a young Canadian who came to the United States, opened a store in Seattle, failed, and then went on to Los Angeles to found two of America's great stores—the Broadway Department Store and Bullocks. . . . It is interesting to note that in his first advertisement he announced 'The Broadway Department Store, the first to use pennies. . . .' Nothing less than a 'nickel' had, before that, passed for money in the California metropolis.

"Scruggs-Vandervoort-Barney, Inc., St. Louis, was started as a piece goods and women's apparel store in 1850. . . . An old delivery employee, who lived until a few years ago, said that he could well remember an injunction from the superintendent, 'Sales were very poor today; you had better not give the horses any oats tonight.' He also told of the time when an epidemic of epizootic laid all the horses low, and the store made all deliveries with oxen hitched to a spring wagon.

"Jordan Marsh in Boston started as a wholesale house in 1851, and ten years later a retail store was adopted as an adjunct. . . . He (Mr. Marsh) developed extremely fine personnel policies 'for his day, and was in the forefront in adopting liberal return privileges, and was one of the first to say, 'The customer is always right.'

"Field, Leiter Co. was an early Chicago dry goods store. The name was changed to Marshall Field and it became a more or less complete department store around 1870. It always has been and still is recognized as 'The Great American Store.'

"Justus C. Strawbridge and Isaac H. Clothier

set up a partnership in Philadelphia in 1868. . . . An old employee . . . wrote some reminiscences of the store in 1876: 'There were stools fastened to the floor with revolving wooden seats; gas fixtures hanging from the ceiling with a large ring at the bottom of which were placed six jets. . . . The dark room in the basement was to show customers how colored silks would look under gaslight. . . . Store hours were 7:45 A.M. to 6:00 P.M. Forty-five minutes were allowed for lunch. Most of the men came to work arrayed in double-breasted frock coats and silk hats, and most of them wore moustache, short beard or burnside.'

"Emery-Bird-Thayer opened its doors in Kansas City in 1863, just two years before the first railroad train arrived in the city. . . . The little store supplied both dry goods and groceries to the stages setting out along the Santa Fe Trail."

The Department Store Story goes on to tell how John Wanamaker became "a department store operator in spite of himself." His first idea was to set up a shopping center similar to the old Halles Central in Paris or the Royal Exchange in London, where cooperating merchants would maintain their various shops under one roof. But when the other merchants in Philadelphia refused to go along with him, he opened in 1877 the Grand Depot in which he was all the merchants. He was a pioneer in modern retail advertising, and after Thomas A. Edison's electric bulb had its first exhibition, he sought out the inventor with the result that Wanamaker's store was lighted by electricity in December 1878. It is said that on the first day the lights were turned on, crowds gathered outside the store to watch it blow up."

In considering the growth of modern department stores, credit must also be given to the information on all phases of department store merchandising available to them, individually, through various trade associations. Many of

these associations have member stores in all parts of the United States, and often in foreign countries as well. See also NATIONAL RETAIL DRY GOODS ASSOCIATION.

Information on markets, fashion trends, and management procedure is pooled in conference where executives of member stores discuss problems and the results of new methods, to the mutual advantage of the entire group.

In these conferences personnel directors will meet to discuss personnel procedure; merchandising executives will talk of markets; and fashion coordinators discuss what is new in the field of fashion—silhouettes, colors, fabrics, etc.

In this way the smaller stores in such groups have helpful information made available to them which they might not be able to acquire individually.

In addition to these associations, most large department stores have buying offices in foreign cities; and practically all department stores send their buyers frequently to the various American markets, and at least once a year on buying trips to Europe, to South America, and to the Orient.

In common with most important business concerns today, department stores are giving increasing, constructive attention to various types of employee activities. Hobby shows, which encourage individual talent in many lines, are becoming more and more popular; most stores have either an employee chorus, dramatic club, orchestra—or all three. Length of service is recognized by "Silver" or "Quarter Century" clubs, which hold annual banquets, and which welcome new members with appropriate awards and ceremonies. For the younger employees, basket ball, bowling, soft ball teams, etc. offer competition with other teams, both within the store and with outside organizations, and help to engender a spirit of good fellowship, and store loyalty.

The employees' magazine or weekly newspaper gives impressive space to promotions, courtesy awards, and selling records, as well as to many store events in which employees take part. If well edited, these papers do a helpful job in keeping alive the friendly interest that prevailed in the store's early days, when the organization was small and the employees all knew one another.

It is not only in the United States that the department store is a powerful factor in merchandising. In most of the cities throughout the civilized world, department stores may now be found, doing a volume of business that varies from country to country. Among such stores may be mentioned:

- Argentina.**—Buenos Aires: Harrods
Australasia.—In Australia: Melbourne's chief department store, Myer Emporium, is said to be the largest in the Southern Hemisphere. In Sydney are David Jones and Farmer & Co. In New Zealand, Farmers Trading Co. (Auckland), Beath & Co. (Christchurch), and Kirkcaldie & Stains (Wellington) are representative.
Brazil.—Rio de Janeiro: A Exposição-Modas S.A.
Canada.—The historically famous Hudson's Bay Company has stores all over Canada. In Montreal, there are Dupuis Frères, and Henry Morgan & Co. In Toronto is the T. Eaton Co. Ltd. which operates 35 Canadian department stores and a huge mail order business. This company's mammoth mail order catalog is printed in both French and English, and is often referred to, affectionately, as The Farmers' Bible. Also in Toronto is the large department store of the Robert Simpson Co. Ltd.
Cuba.—Havana: Solis Entrialgo
Denmark.—Copenhagen: A. Fønnesbech
England.—London: Harrods Limited, Knightsbridge. London. Harrods Stores was founded over 100 years ago, and has approximately 180 selling departments

and a total staff of nearly 5,000. Harrods is the largest in a group of stores which, in addition to itself, consists of D. H. Evans and Co. Ltd., and Dickens and Jones Ltd., both in London, and the following: Manchester: Kendal Milne and Co. Liverpool: Wm. Henderson and Sons Ltd. Sheffield: John Walsh Ltd. Torquay: J. F. Rockhey Ltd.

Another important London store is Selfridges. Harry Gordon Selfridge, an American by birth, started his merchandising career with Marshall Field in Chicago, and went to England in 1906, where he organized Selfridge & Co. Ltd. and built it into one of Europe's largest department stores.

France.—Paris: Galeries Lafayette, probably one of the best known stores on the Continent. Two other famous stores are: Bon Marché, Au Printemps.

Germany.—Cologne: Handelsstatte Mauritius, leader of a chain which has stores throughout Germany.

Hawaii.—Honolulu: Liberty House

Italy.—Milan: La Rinascente

Japan.—Tokyo: Matsuzakaya; and Takashimaya. In Yokohama, Kobe, and Osaka, will be found stores of Mitsui Soko Co. Ltd.

Mexico. Mexico City: El Palacio de Hierro

Netherlands.—Amsterdam: N.V. Mag. de Damrak Bijenkorf

South Africa.—Cape Town: Garlicks; in Durban: Payne Bros. Ltd.

Sweden. Stockholm: Nordiska Kompaniet

Although this list is, of necessity, far from complete, owing to lack of space, it will be sufficient to show the wide geographical range of the department store type of merchandising, and its amazing growth in less than 100 years.

MARGUERITE ASPINWALL.

DEPARTURE, a nautical term signifying the distance along a parallel of latitude measured in nautical miles, especially the distance made by a ship in a course due west or due east. When the course is other than east or west *departure* is the distance sailed \times sine of course. Taking a departure is determining the exact position of a ship on the outset of a voyage and after leaving port.

DE PAUL UNIVERSITY, a Catholic co-educational institution in Chicago, Ill., but non-Catholics are admitted. Originally St. Vincent's College, it became De Paul in 1907. There are colleges of liberal arts, law, commerce, music, a graduate school, an academy, and an evening high school. Enrollment (1953) was 9,222 students.

DE PAUW, dē-pō', Washington Charles, American manufacturer: b. Salem, Indiana, Jan. 4, 1822; d. New Albany, Indiana, May 5, 1887. He received a liberal education; worked himself up to the foremost rank among the business men of his state; and was successively a mill-owner, a merchant, and a banker. He was noted for his extensive gifts in behalf of education. His aid to the Indiana Asbury University set it upon a sound basis, and its name was changed to De Pauw University in his honor. He also founded De Pauw College for Women and several charitable institutions at New Albany, Ind.

DE PAUW UNIVERSITY, a coeducational institution in Greencastle, Ind.; founded in 1837, under the auspices of the Methodist Episcopal Church, and known as the Indiana Asbury University until 1884, when the name was changed to De Pauw University. In the original charter of the institution there existed provisions for schools of divinity, law, medicine, art, music and pedagogy, and of liberal arts. At some period in the course of its existence the university has instituted and conducted every one of these. Insufficient endow-

ment and income rendered it impossible to keep these professional departments up to the standard which the institution set itself and it suspended all except the school of music, thus leaving only the college of liberal arts and this school in operation at present. The value of grounds and equipment is nominally over two and a quarter millions, and the productive funds amount to about five and a half millions.

DE PERE, dê-pêr', Wis., city in Brown County, on the Fox River, 6 miles from its mouth at Green Bay; 109 miles north of Milwaukee; on the Chicago, Milwaukee, St. Paul and Pacific Railway. A shipping and transfer point, it has grain elevators and boat works. Manufactures include paper, boilers, and farm implements. It is the site of St. Norbert's College (Roman Catholic). Here, at the first rapids of the Fox, Jean Nicolet in 1634 found a large village of several thousand Indians of different linguistic stocks. In 1670 Father Claude Jean Allouez established a Jesuit mission; hence its first name of Rapides des Pères. Marquette at this mission wrote his account of Mississippi explorations in 1673-1674. Incorporated as a village 1857, as city 1883. Pop. (1950) 8,146.

DEPEW, Chauncey Mitchell, American lawyer, legislator, and orator: b. Peekskill, N. Y., April 23, 1834; d. New York, N. Y., April 5, 1928. A Yale graduate in 1856, he studied law in Peekskill and in New York and was admitted to the bar in 1858. He was soon after elected to the New York assembly and served as chairman of the committee on ways and means. For a time he was acting speaker of the state legislature. In 1863 he was nominated on the Republican ticket for secretary of state of New York and was elected by over 30,000 majority. In 1865 he declined a renomination. President Andrew Johnson tendered him the Japanese mission in 1866, but Depew declined the office to enter the service of the New York and Harlem Railroad as attorney. In 1869, when the consolidation occurred of the Hudson River, Harlem and New York Central railroads he was made a director and attorney for the newly organized company. In 1872 he accepted the nomination for lieutenant governor on the Republican state ticket, but was defeated by a small plurality. In 1875 he became general counsel for the entire Vanderbilt system of railroads, and in 1882 second vice president of the reorganized New York Central and Hudson River Railroad, and president in 1885. The same year Yale College conferred upon him the title of LL.D. During this period he was acting as a regent of the University of the State of New York. He remained president of the New York Central until 1898, when he became chairman of the board of directors of the Vanderbilt system, which included the New York Central and Hudson River, Lake Shore and Michigan Southern, Michigan Central and the New York, Chicago and Saint Louis railroads. His political career during these later years was eventful. In 1885 he declined the election to the United States Senate. In 1888 he figured prominently as a candidate for the presidential nomination at the National Republican Convention, withdrawing from the contest in favor of Benjamin Harrison, of Indiana, who, after his election and elevation to the presidency, tendered to Depew the position of secretary

of state, which was declined owing to large railroad interests. In 1899, on January 17, he was elected to the United States Senate as junior member from New York State. He remained in the Senate until 1911. He became involved in the investigation of certain New York life insurance companies in 1905, with the result that he repaid to the Equitable Life Assurance Society, of which he was a director, a loan made to a concern in which he was interested, and he resigned from the directorate of the Equitable. From 1885 Depew was regarded as one of the leading Republicans of the country. In 1871 he married Elsie Hegeman, who died 1893, leaving one son. He was married again in 1901 to May Palmer. Depew's fame abroad was even greater than in the United States. In London and Paris he was regarded as America's representative citizen. This fame rested largely upon his ability as orator, after-dinner speaker and lecturer. He delivered important addresses at the Washington Centennial at New York in 1889 and the dedication of the World's Columbian Exposition, at Chicago, in 1893, and orations at the memorial services of President Garfield and General Sherman. As a wit and humorist, Depew acquired a name second to none in this country. He was in great demand for many years at dinners and banquets as the chief after-dinner speaker. He published *Orations, Addresses and Speeches* (8 vols., 1910) and *My Memories of Eighty Years* (1922).

DE PEYSTER, dé pis'tér, Abraham, American merchant: b. New York, July 8, 1657; d. there, Aug. 2, 1728. He was the eldest son of Johannes DePeyster (q.v.); and filled many important public offices after the final cession of New Netherland to Great Britain. Between 1691 and 1695, he was mayor of New York, and subsequently became chief justice of the province and president of the king's council, in which latter capacity in 1701 he acted as colonial governor. He was also colonel of the forces of New York and treasurer of the provinces of New York and New Jersey. A statue was erected to him at Bowling Green, New York City.

DE PEYSTER, Arent Schuyler, British military officer: b. New York, June 27, 1736; d. Dumfries, Scotland, November 1832. He was a grandson of Abraham DePeyster (q.v.). In the American Revolution he was a colonel in the Royal army; was at different times in command of the British posts of Detroit, Mackinac and elsewhere in Canada.

DE PEYSTER, Johannes, American colonial merchant: b. Haarlem, Holland, 1600; d. New York about 1685. He was one of the early settlers of New York; and became prominent in public affairs during the Dutch possession; was one of the last to swear allegiance to the Crown after the English succeeded to the government; served several times as alderman and deputy mayor, and was frequently urged to become mayor by the English residents, but declined from ignorance of the language.

DEPILATORIES, chemical and other applications used to remove the hair from the body, especially the face and scalp, without injuring the texture of the skin. Quicklime, caus-

tic alkalis, arsenic barium sulphide and orpiment are the most common ingredients. The most celebrated depilatory is the *rusma*, used by Oriental nations, which consists of quicklime and orpiment (trisulphide of arsenic) boiled in water impregnated with a strong alkaline lye. The parts which are to be deprived of hair are rubbed with this mixture, and after a time washed in warm water. This depilatory acts with great energy, and the utmost care is necessary in using it that it may not irritate and injure the skin. Sometimes a plaster of pitch and resin is used for the same purpose. The best and most effective means of removing the hair today is by means of a galvanic current, and needle electrode, which is applied directly to the hair follicle, thus killing it. This procedure is sometimes called electrolysis. There are few depilatories that are free from all chance of poisoning, and none that are not liable to leave a scar unless used with the utmost care.

DEPONENT, in *Latin grammar*, a verb which is passive in the conjugation of its tenses, but active in meaning. The old grammatic fiction was that such a verb laid aside (*deponens*, laying aside) its passive meaning. These verbs were originally reflexive.

In *law*, a deponent is a person who makes a written statement under oath, that is, a deposition (q.v.).

DEPOSIT, in geology, a term applied to substances laid by crystallization or by settling from a fluid. Thus sedimentary deposits are of gravels, sands, silts, or clays dropped from water or from air; mineral deposits are rocks having a concentration of one or more minerals of economic value; and cave deposits are of debris accumulated in an underground opening. The term does not have limited technical definition.

DEPOSIT, in law, the delivery of money or other personal property by one person to another for safekeeping or some other purpose; also, the property so delivered, such as a down payment, a pledge or security, or a forfeit. As a verb, deposit means to deliver property for safekeeping, as a pledge, or for some other purpose, usually with the implication that it will be returned. As applied to money, the phrase "on deposit" has a well recognized meaning and indicates the existence of an agreement that the depository will repay the money upon demand of the depositor. The term "bank deposits," however, according to accepted usage, includes not only funds payable on demand and subject to check, but also deposits not subject to check, for which certificates of deposit (whether interest bearing or not) are issued, payable at some future time or on a specified notice.

A general deposit consists of a delivery of money or funds to a bank, with title passing to the latter and an obligation arising on its part to repay a similar amount out of its general funds. A special deposit, on the other hand, must be kept separate from the other assets of the bank for redelivery intact to the depositor on demand. Title to a special deposit remains at all times in the depositor, the relationship between him and the bank being that of bailor and bailee, rather than creditor and debtor. The distinction between general and special deposits has an important bearing on the ability of the depositor to recover the entire fund in case of the bank's in-

solveny, as well as on the existence of liability on the part of the bank in the event of loss.

RICHARD L. HIRSHBERG.

DEPOSIT CURRENCY. See CURRENCY.

DEPOSITION, a written statement under oath, particularly the testimony of a witness, furnished for use in a judicial proceeding with opportunity for cross-examination afforded to the adverse party. A deposition is given in response to oral or written questions, and is thus distinguishable from an affidavit, which is made without formal interrogation and without questioning by the opposing counsel. The right to take depositions depends upon various factors, some of the more important of which are the competency, relevancy, and materiality of the testimony proposed to be embodied in them, the value of the testimony to the litigant in establishing his case, the stage to which the lawsuit has progressed with respect to the formulation of issues, and the competency and physical location of the witness. Under some statutes and rules, authorization to take depositions must be obtained from the court in each case, but in other jurisdictions they may be taken merely upon giving reasonable notice to the adverse party. The right to use depositions as evidence depends upon the conditions existing at the time of the trial, particularly the availability of the deponent to testify in person. For deposition in religion, see DEPRIVATION.

RICHARD L. HIRSHBERG.

DEPOSITION OF METALS. See ELECTROPLATING.

DEPOT, *dē-pō*, or, in military and British usage, *dēp'ō*, a word derived from French *dépôt* (Lat. *depositum*). The word is used of a place where goods are received and stored; hence, in military matters, of such places as a supply storage point or a station for assembling recruits. In the United States the word has had long use as applied to a railway passenger station, though by the mid-20th century it had become largely obsolete in some areas and "station" or "terminal" had replaced it in currency. Nevertheless, despite the diffusion of urban and suburban modes and despite a continuing revolution in transportation, terms such as "depot agent" or "depot master," "depot hotel," "depot carriage" or "depot wagon," and even "depot platform" remained important keys to an era and a way of life. In Great Britain the word has been applied to a railroad goods station, but not to a passenger station.

DEPRAVITY. A theological doctrine which has been the subject of much discussion. The Calvinists held that because of the fall of man our depravity was total, involving even the bondage of the will and an inability to do any spiritual good. On the other hand, the teaching of Arminianism was that depravity was only a bias, which was entirely nullified by belief in the efficacy of salvation in Christ. The freedom of the human will and the consequent right of choice determines the continuation of depravity.

DEPRES, *dē-prē'*, or **DES PRES**, *dā-prā'*, **Josquin** or **Josse**, Flemish composer: b. Hainaut about 1450; d. Condé-sur-l'Escaut, France, Aug. 27, 1521. Little is known of his personal his-

tory. A boy chorister at the Collegiate Church at Saint-Quentin, he was later canon and choir-master at that church. It is possible that he studied under Jean d'Okeghem. In 1475 he was a chorister at the court of Galeazzo Maria Sforza in Milan, Italy, and from about 1486 to 1494 he sang in the papal choir at Rome. He also spent some time at Florence, Modena, and Ferrara. Later, he returned to Burgundy, where at last he settled in Condé-sur-l'Escaut. His works form a connecting link between those of Okeghem and those of Orlando di Lasso and Giovanni Pierluigi Da Palestrina; his contemporaries regarded him as the foremost composer of his time. Sung every where in his own day, his works completely unite word and tone, and thus fuse contrapuntal devices into forms of great beauty. Contrasting styles appear in his compositions: an intricately contrapuntal style, typically Netherlandish, and a homophonic style, probably derived from Italian influences. Many of his masses were published by Ottaviano dei Petrucci, in three books (1502, 1505, and 1514). Others, including *Pange lingua* and *Da Pacem*, were published later. His motets were published before his death by Petrucci and others, but his French chansons were not published until 1545. A. Smijers has edited his complete works, *Werken van Josquin de Prés*, 26 vols. (1921-1950).

DEPRETIS, dâ-prâ'tès, **Agostino**, Italian statesman: b. Mezzano-Corte-Bottaroni, near Stradella, Italy, Jan. 31, 1813; d. there, July 29, 1887. He studied law at the University of Pavia, where he became active in the Mazzini movement, and in 1848 was elected as a legislative deputy. With Cesare Correnti and others he founded the journal *Il Progresso*. He was named governor of Brescia in 1859, and in 1860 went to Sicily as pro-dictator for Giuseppe Garibaldi. He served in a number of the Italian ministries, beginning in 1862 as minister of public works under Urbano Rattazzi. Under Bettino Ricasoli in 1866-1867 he was minister of marine, and afterward held the portfolio of finance. Leader of the Left after the death of Rattazzi in 1873, he first served as prime minister during the years 1876-1879, was minister of the interior in 1879-1881, and served again as prime minister from 1881 to 1887. The reforms which he introduced included transformism (See *ITALY—History*), abolition of the grist tax, and extension of the suffrage, but his domestic program included more questionable practices, also. For example, he continued political bribery on a large scale. In foreign affairs, he promoted the Triple Alliance with Germany and Austria, and began the Italian East African empire by taking over the Eritrean ports of Assab (1882) and Massawa (1885).

DEPREZ, dē-prā', **Marcel**, French engineer and pioneer electrician: b. Aillant-sur-Milleron, Department of Loiret, France, Dec. 29, 1843; d. Vincennes, Department of Seine, France, Oct. 13, 1918. In 1882 he exhibited at Munich, together with Cornelius Herz, a machine of the Gramme type which transmitted electrical power over a distance of some 35 miles between Miesach and Munich. This transmission has been described as the first step toward a solution of the problem of transmitting electrical power over long distances. Deprez also worked on such problems as friction, the mechanical equivalent of heat, and the regulation of the speed of electric motors;

and with Arsène d'Arsonval and Jules Carpentier he constructed an aperiodic galvanometer, an ammeter, and a wattmeter. In 1886 he was named to the Académie des Sciences, and in 1890 he became a professor at the Conservatoire des Arts et Métiers.

DEPRIVATION, the removing of a clergyman from his benefice on account of heresy or misconduct. It entails, of course, loss of all emoluments, but not the loss of clerical character, except it be *deprivatio ab officio*, or deprivation of office, which then becomes deposition or degradation. The lighter punishment, simply taking away a clergyman's living or preferment, is called *deprivatio a beneficio*.

DE PROFUNDIS, dē prō-fūn'dīs, the 130th of the Psalms of David (129th in the Douay version); one of the seven psalms expressive of sorrow for sin and desire for pardon used in the liturgy of the Roman Catholic Church and called the Penitential Psalms (q.v.). The name *De Profundis* comes from the Latin version of the first words of the psalm, "Out of the Depths."

DEPTFORD, dēt'fērd, metropolitan borough, London, England, located in the southeast section of the city, on the south bank of the Thames, immediately west of Greenwich. It is a residential and industrial area, producing soap, chemicals, wood products, and foods. The dockyard which was established at this place in 1513, and around which the borough developed, came to be the most important dockyard in the British Isles. Christopher Marlowe was killed in a Deptford tavern in 1593. John Evelyn lived at Sayes Court, Deptford, from 1652 to 1694, and in 1698 Peter the Great of Russia, while working as a shipwright at the dockyard, sublet Sayes Court from Evelyn's tenant. It was from Deptford that Captain Cook sailed on his last voyage (1776). The dockyard was closed in 1869, and in 1871 a foreign cattle market occupying much of the site was opened. Pop. (1951) 75,694.

DEPUTIES, Chamber of. See **CHAMBER OF DEPUTIES**.

DEPUTY, a lieutenant or substitute who exercises power which properly belongs to another who has placed him in his stead. The appointment of a deputy does not free the principal from responsibility. A deputy must take an oath of office. His salary is paid by the government. If authorized for the time being to act with full power of his principal he is called a general deputy and may act in his own name. Otherwise, when acting in a particular and limited matter, he is only a special deputy. Generally deputies may be appointed only by administrative and executive officers.

In the bicameral legislatures of many countries—France, for example—members of the lower house are called deputies.

DE QUEEN, dē kwēn', city, Arkansas, the seat of Sevier County, located near the Oklahoma border at an altitude of 426 feet. Served by federal highways and the Kansas City Southern Lines, De Queen is a shipping center for a farming and timber region; chief products are fruits, vegetables, poultry, lumber, and creosote. It was incorporated in 1897. Pop. (1950) 3,015.

DE QUINCEY, Thomas, English miscellaneous writer: b. Manchester, England, Aug. 15, 1785; d. Edinburgh, Scotland, Dec. 8, 1859. In a striking sense, DeQuincey's life and writings are distinct; for by far the most interesting events in his life took place before 1821, the year of his first publication, after which the course of his life is of an interest wholly secondary to his writing. He was the son of Thomas Quincey, a well-to-do merchant, of a family that had come to England with the Conqueror. His mother was a Miss Penson, a lady of quality. He was the fifth child and second son among eight children of diverse temperaments. Most of his youth was spent at Greenhay, an estate near Manchester, where, though dominated by the will of an imperious older brother, his life was that of a shy, sensitive child, of lively imagination, and with a great love for mysterious and fanciful literature. After studying with a private tutor, he was sent to school at Bath, where he distinguished himself in Latin and Greek, and, in 1800, after a visit at Eton and a summer in Ireland with his friend, Lord Westport, to the Manchester Grammar School, to the end that he might prepare for Brasenose College, Oxford. A year and a half, however, was all that he could stand of a regime which deprived him "of health, of society, of amusement, of liberty, of congeniality of pursuits and which, to complete the precious picture, [admitted] of no variety." Early one morning in July 1802, he ran away from his master's house, and for nearly a year lived a vagrant life. For some months he roamed about North Wales, with the knowledge of his mother and the support of his uncle, but in November he cast away this support and went to London. Here, according to his own account, he endured many hardships, was frequently obliged to sleep in the streets, to share the lot of vagrants like himself, and to resort to moneylenders for support. He was finally discovered by his family. In the fall of 1803 he entered, by his own choice, Worcester College, Oxford, and here he remained off and on till 1809, but never took a degree. Though little in particular is known about his life at the university, he was distinguished as an admirable Greek scholar and read prodigiously in English literature and German metaphysics. His feeling of superiority and his desire for privacy, together with a straitened income, were the reasons for his seclusion. Leaving Oxford in 1808, he went to live at Grasmere in order to be near Wordsworth and Coleridge, and in the Lake region he remained almost continuously till 1821. His life here was a very studious one, in which the most conspicuous determinant was the confirmation of his habit of opium taking. He had first experimented with the drug in 1804, at Oxford, as a relief for an attack of neuralgia, and thereafter, until 1813, took it systematically at intervals of two or three weeks simply for the pleasure that it gave. In the latter year however, he "was attacked," as he says, "by a most appalling irritation of the stomach, in all respects the same as that which had caused me so much suffering in youth, and accompanied by a revival of the old dreams." It was then that he began taking opium regularly and in large quantities. To some extent he broke the habit at the time of his marriage, in 1817, to Margaret Simpson, the daughter of a farmer in his neighborhood, but the general effect was great prostration of his will, and, though in later years, he had the habit under

control, he probably never altogether shook it off. It was some time before he could bring himself to do anything. His first piece of active work, after the failure of his attempt to write a philosophical work, *De Emendatione Humani Intellectus* and an unfinished *Prolegomena to all Future Systems of Political Economy*, was the editorship of the *Westmorland Gazette*, which office he occupied about a year, 1818-1819. The chief result of all this was to stimulate in him a desire to write, and in September 1821 he published in the *London Magazine* the first part of his most striking and popular work, *The Confessions of an Opium Eater, being an Extract from the Life of a Scholar*.

Then began the prolific course of writing which has made DeQuincey the prince of magazine writers. It is unnecessary, from this point, to trace his career in detail. The main facts up to his death are that from 1821 to 1825 he lived chiefly in London, where he wrote a great deal for the *London Magazine*. Then he returned to Westmorland whence he contributed largely to *Blackwood's Magazine*. In 1830 he settled in Edinburgh, and here and at the suburb, Lasswade, he remained till his death. His articles appeared chiefly in *Blackwood's*, in *Tait's Edinburgh Magazine*, and, latterly, in *Hogg's Weekly Instructor*. His life was a very secluded one. Stories are told of his eccentricities and his absent-mindedness. His quiet was disturbed only by the death of his youngest daughter and his wife. For 20 years at Edinburgh he was obliged to support himself and his large family by his pen, but toward the last decade, legacies enabled him to live in more ease and to give his thought to a complete edition of his collected writings, of which the first volume appeared in 1853.

DeQuincey's published work contains about 150 titles, representing articles varying in length from the moderately long novel *Klosterheim* (1832), and the historical picture *The Caesars* (1832-1833), to short sketches such as *On the Knocking at the Gate in Macbeth* (1823), and *English Dictionaries*, an incomplete note. A compact arrangement of his works, that adopted by Professor David Masson, is into autobiography, literary reminiscence and confessions; biographies and biographical sketches; historical essays and researches; speculative and theological essays; political economy and politics; literary theory and criticism; and tales, romances and prose treatises; with some miscellanea chiefly in the form of imaginative prose.

In almost all these classes DeQuincey achieved great, though unequal, success. Popularly, he is best known by the writings in which he exploited his own life and by the dream prose which resulted from his habit of opium-eating. The *Confessions* is naturally his best-known work, but scarcely less in interest are his autobiographical sketches. His dream prose, which has done probably more than any other of his writings to make great his name as a stylist, is best represented by such remarkable pieces as *Suspiria de Profundis* (1845), of which the most famous is *Levana and Our Ladies of Sorrow*. All of them are illustrations, as it were, of the states of mind which he describes in the *Confessions*. Much of the same sort of value attaches itself to the less sensational sketches of his contemporaries, and the instinct of self-revelation is here tempered by the addition of brilliant analyses of the characteristics of his great contemporaries.

Much of DeQuincey's dream prose is sometimes included under the head of his narrative writing. His best narrative certainly has the qualities of his imaginative work. In this class are to be found his brilliant *Three Memorable Murders* with its introductory extravaganza, *Murder Considered as One of the Fine Arts* (1827-1839), *The Spanish Military Nun* (1847), and what is probably, all in all, his masterpiece, *The English Mail-Coach* (1849). Several of these narrative pieces, like the excellent *Flight of a Tartar Tribe* (1837), may more properly, as regards subject, be classed as historical writings. In all these DeQuincey is always brilliant and successful. The same, however, cannot be said of his attempts to write stories and novels. His essays in this field were all comparatively early, took the form of melodramatic, supernatural tales, like *The Fatal Marksman* (1823), translations from the German, like *The Dice* (1823), or of long turgid romances, like *Klosterheim* (1832), and *The Avenger* (1838).

Of as great importance as the analytical and narrative papers, though not so popularly known, are the biographical and the critical writings. These are hard to separate into distinct classes. DeQuincey was too much interested in analysis to be a strictly good biographer, and whereas the essay on Shakespeare (1838), for example, is mainly biographical, it rambles into minute questions and contains much matter of a purely critical sort. On the other hand, much of his critical work is in no sense biographical; such are his well-known essays on *Rhetoric* (1828), and *Style* (1840-1841), and the numerous paradoxical statements of critical theory with which he frequently enlivened the pages of contemporary reviews. As good examples as any of his idea of biography and criticism may be obtained from his various essays on Alexander Pope. That of 1837 is chiefly biographical; those of 1848 and 1851 are critical, and the last, *Lord Carlisle on Pope*, characteristically takes the form of dissent from an accepted view. For the most part his biography and criticism deals with English writers; outside of them, Germany is his favorite field.

DeQuincey's historical writings, in like manner, are hard to divide, and may best be treated together. Many of them, like *The Spanish Military Nun* and *The Flight of a Tartar Tribe*, are narrative and deal with extraordinary events. He is, however, more likely to be interested in the philosophical aspect of history, as in *The Philosophy of Roman History* (1839). The best known of his writings of this class, and indeed his most ambitious piece of work, is the unfinished *Caesars* (1832-1833), in which he desired "simply to characterize the office of Emperor, and to notice such events and changes as operated for evil, and for a final effect of decay, upon the Caesars or their empire." It is really an attempt to present a general view of "the sublimest incarnation of power, a monument of the mightiest of greatness built by human hands, which upon this planet has been suffered to appear." DeQuincey's more strictly philosophical writings, including his discourses on economics and theology, are also numerous. Typical examples are *On Hume's Argument against Miracles* (1839), *Casuistry* (1839), and *Judas Iscariot* (1853).

In general, in all these writings, DeQuincey deals chiefly with intellectual conceptions and is concerned with objects only to a comparatively slight degree and for an ulterior pur-

pose—that of showing the underlying subtlety. He deals in distinctions, his interest lies in intellectual phenomena, and he is appealed to by the logic of situations.

DeQuincey is usually regarded as among the English masters of prose style. The appellation, with regard to him, signifies a marvelous and unflinching command of means of expressing very minute shades of thought and feeling, combined with the power to write, on occasion, sonorously, grandly and very wittily. He is always discursive and intricate, to a degree almost unparalleled among masters of prose. As a critic he has few superiors, and as a thinker few masters in point of delicacy and exactness, but many in profundity. See CONFESSIONS OF AN ENGLISH OPIUM EATER, THE; DE QUINCEY'S AUTOBIOGRAPHIC SKETCHES.

WILLIAM T. BREWSTER,
Professor Emeritus of English, Columbia University.

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DE QUINCEY'S AUTOBIOGRAPHIC SKETCHES. What is commonly called *The Autobiography* of Thomas DeQuincey is more accurately entitled *Autobiographic Sketches*. This latter title suggests the mode of composition. DeQuincey did not deliberately plan and forthwith compose his autobiography. Rather he began by contributing reminiscent articles to periodicals, a practice which he continued until he had written and published about 30. In 1853, he collected these articles, revised, enlarged and polished them with his customary diligence, and gave them to the public under the title *Autobiographic Sketches*. The reader must not suppose that all of DeQuincey's autobiographical work is contained in these collected articles; the *Sketches* must be supplemented by a large amount of other reminiscent composition, particularly by the *Confessions of an English Opium Eater*, by *The English Mail Coach*, and by that noteworthy series of papers included under the general title, *Suspiria de Profundis*. In truth, all of these compositions might, with entire propriety, be included under the title *Autobiographic Sketches*. As a matter of fact, the autobiography of DeQuincey, more than that of almost any other man, is fragmentary—a succession of sketches loosely connected and widely scattered. DeQuincey lived from early childhood in a dream world; the record of his successive dreams constitutes the true inner autobiography of the man. He might have written an objective account of the outward events of his life and thus have attained a brevity and a form such as David Hume attained in his autobiographic sketch. Fortunately, DeQuincey did not do this, and, in consequence, we may know his spirit as we may know the spirit of only a few men. Apart from their value as a revelation of DeQuincey's soul, the *Autobiographic Sketches* are remarkable from

a purely literary point of view. To be sure, they exhibit both the defects and the virtues of DeQuincey's style. At one time, we are carried rapidly on by the swift flow of the author's "impassioned prose"; at another, we are becalmed by sluggish, almost uninteresting narrative. In general, however, the style is of high quality and the narrative compelling. Few readers can ever forget DeQuincey's account of his visit "about an hour after high noon" to the chamber where his little sister lay dead; of the Sunday mornings when he went with his family to a "church having all things ancient and venerable, and the proportions majestic"; of his stay at "Oxford, ancient mother, hoary with ancestral honors." The appeal of the whole series is strong, and it is the experience of most readers that they return to these *Sketches* frequently to commune with the strange elfin spirit of DeQuincey; to pass under the spell of the "organ music" of his rhetoric; to feel something of that "mighty and essential solitude" which, in the words of the author, "stretches out a sceptre of fascination" for us all.

WALDO H. DUNN.

DE QUINCY, dē kwīn'sī, town, Louisiana, in Calcasieu Parish, 20 miles northwest of Lake Charles city. Located in an oil and timber region, De Quincy has agricultural and wood-products industries. It was settled in 1898, incorporated in 1902, and is governed (1952) by a mayor and two commissioners. Pop. (1950) 3,837.

DERA GHAZI KHAN, dā'rā gā'zī kân', district and town, Pakistan, located in Multan Division, Punjab Province. The district covers an area of 9,364 square miles on the right bank of the Indus, and consists of an alluvial strip of land shut in between the Sulaiman Range and the river. Its capital is the town of Dera Ghazi Khan, which lies about seven miles east of the Indus, 50 miles west-southwest of Multan. Ghazi Khan, son of a Baluch chieftain, founded the town toward the close of the 15th century. Periodic floods caused its removal in the early 1900's from its original site on the river. It is now a trade center for agricultural products, and engages also in cotton ginning, food processing, and handicraft production. There is a college of arts. Pop. of the district (1951) 628,000. Pop. of the town (1951) 36,239.

DERA ISMAIL KHAN, is'mil kân', district and town, Pakistan, located in North-West Frontier Province. The district, 4,216 square miles in area, lies north of that of Dera Ghazi Khan, and has the same eastern and western boundaries. Most of it is comprised in the Derajat (q.v.). The Sikhs under Ranjit Singh held it in the early 19th century. Its capital, the city of Dera Ismail Khan, is on the Indus River, 150 miles south-southwest of Peshawar. The city was founded at the end of the 15th century by Ismail Khan, a Baluch chieftain. It markets grains and engages in the trade of such other products as cloth fabrics; wood lacquering is an industry. There is a college. Pop. of the district (1951) 283,000. Pop. of the town (1951) 41,663.

DERAIN, dē-rân', **André**, French painter: b. Chatou, Department of Seine-et-Oise, France, June 10, 1880. He attended L'École Polytechnique. Turning to painting at the age of 15, he studied in Paris under Eugène Carrière, and for

several years shared a studio with Maurice de Vlaminck at Chatou. His early work was post-impressionist, influenced by the paintings of Vincent Van Gogh, Paul Gauguin, and Paul Cézanne, and in 1905 he was one of *Les Fauves* who exhibited together at the Salon d'Automne. His private studies covered the whole scope of art, and he assimilated into his work elements not only of traditional and modern European art, but also, for a while at least, elements from such fields as primitive African sculpture. Although he engaged in discussions which led to the birth of Cubism, he himself did not become a Cubist, but his work evolved instead toward a more naturalistic style and a quieter palette. His paintings include landscapes, still lifes, and figure studies. He illustrated such books as Guillaume Apollinaire's *L'Enchanteur pourissant*, and designed settings and costumes for Serge Diaghilev's ballet *La boutique fantasque*.

DERAJAT, dā'rū-jā, alluvial plain, Pakistan, extending about 180 miles between the Sulaiman Range and the Indus River, in southwest Punjab Province and southeast North-West Frontier Province. It is about 40 miles wide. Products include wheat, rice, cotton, millet, and jute.

DERBENT or **DERBEND**, dēr-bent', -bend' ("gateway"), city, Dagestan Autonomous Soviet Socialist Republic, Russian Soviet Federated Socialist Republic, USSR. The second largest industrial city and cultural center of the Dagestan ASSR, it is located on a narrow coastal plain between the Greater Caucasian mountains and the Caspian sea, 140 miles northwest of Baku, with which it is connected by railway and highway. Ancient walls dating from 567 A.D. surround Derbent, which also has an ancient citadel, historic caravansaries, and a mosque originally built in 733 A.D. Situated in a fruit-growing region and near mountain pastures, the city engages industrially mainly in fruit canning, wine brewing, and the weaving and sewing of wool. As gateway to north Persia, Derbent has had a long and stormy history. From the 7th to 9th centuries, it was ruled by the Arab caliphate, and later by local emirs, Mongols, and Persia. Russian annexation was in 1813. Pop. (1939) 27,476.

ELLSWORTH RAYMOND.

DERBIGNY, Pierre Auguste Charles Bourguignon, American statesman: b. Laon, department of Aisne, France, 1767; d. New Orleans, La., Oct. 6, 1829. In about 1793 he was obliged to flee from France to Santo Domingo. Going thence to the United States, he lived in Pennsylvania and Missouri. After later living in Florida, he moved finally to Louisiana. Under French rule he served as secretary to the municipality of New Orleans, and under the American territorial government of William C. C. Claiborne he was official interpreter. He became a judge of the state's first supreme court in 1813, and was Louisiana's secretary of state from 1820 to 1827. Governor from 1828 until his death, he advocated popular education, and sought to eliminate the political cleavage resulting from differing French and British traditions.

DERBY, EARL OF, a title conferred in 1485 on Thomas, second Lord Stanley, two months after Bosworth Field, where he and his family had greatly contributed to the victory of Henry

VII. In 1406, Sir John Stanley, who had married the heiress, Isabel Lathom, obtained a grant of the Isle of Man, which he and his descendants ruled until 1765. On the death of James Stanley, seventh earl of Derby, in 1736, sovereignty of the island passed to James Murray, second duke of Atholl. His daughter and her husband, John Murray, third duke of Atholl, permitted the English crown to purchase it in 1765.

Prior to the conferring of the title of the earl of Derby on members of the Stanley family it had been borne by others. It was first conferred in 1138, on Robert de Ferrers (d. 1139). Robert Ferrers, 6th earl of Derby (1240?–1279), lost the title. Thereafter it was held by Henry of Lancaster (1299?–1361) and John of Gaunt (1340–1399), and, prior to his acclamation as king in 1399, by Henry IV.

DERBY, dūr'bi, **George Horatio** (pen name JOHN PHOENIX), American humorist: b. Dedham, Mass., April 3, 1823; d. New York, May 15, 1861. He was graduated at West Point (1846) and served with distinction in the army during the Mexican War (1846–1847). He wrote a series of sketches and burlesques, entitled *Phoenixiana* (1855); and *The Squibob Papers* (1859).

DERBY, city, Connecticut, in New Haven County; altitude 60 feet; at the junction of the Naugatuck and Housatonic rivers, 8 miles west of New Haven; on the New York, New Haven and Hartford Railroad. It is a manufacturing city producing metal specialties of brass, copper and bronze, pins, hardware, shoe machinery, foundry products, insulated wire, automobile and airplane parts, chemicals, corsets, and textiles.

A trading post set up here in 1642 on land bought from the Paugasuck Indians, and called Paugasuck, was made a separate town in 1675 and named for Derby in England. From 1660 until 1868, it had a thriving shipbuilding and fishing industry and a considerable West Indian and north Mediterranean trade. The damming of the Housatonic above the town brought the shipping and fishing trade to an end after 1870. In 1836 a copper mill was built on the west bank of the Naugatuck River, and the settlement near it was named Birmingham after the English industrial city. John Ireland Howe (q.v.), American inventor, moved his pin-making plant here in 1838. Derby annexed Birmingham borough in 1893, and was chartered as a city. Ansonia was a part of Derby until 1889. Pop. (1950) 10,259.

DERBY, dār'bi, borough, England, capital of Derbyshire, on the Derwent River and the main line of the Midland Railway, 120 miles north-northwest of London by rail. It has some fine public buildings, among which are the churches of All Saints, St. Alkmund and St. Werburgh, built before the time of Henry VIII. The principal manufactures include silk and cotton products, automobiles, aircraft engines, and porcelain. Here are situated the offices and principal workshops of the Midland Railway. Derby is one of the oldest towns in the kingdom, and is supposed to owe its origin to a Roman station, Derventio, situated at Little Chester, on the opposite side of the river. Under the Danes it took the name of Deoraby. Herbert Spencer was a native of the town. The borough returns two members to Parliament. Pop. (1951) 141,264.

DERBY DAY. The great London holiday on which "The Derby," the most popular and most important English horse race is run. The race, which generally takes place on the first Wednesday in June, is run on Epsom Downs, an undulating plain about 18 miles southwest of the center of London. The course is left-handed, one mile, four furlongs and 29 yards in length. The first seven furlongs is uphill, rising 50 feet in the first half mile, and running away to the right. Then it turns left where the track slopes, soup-plate fashion, toward the inside rails and dropping forward to the famous Tattenham Corner. This is the vital point of the course, for often the race is lost here through the jockey's getting crowded out as the field makes the acute turn into the straight. The forward drop from this point is very slight and the final three furlongs are on the rise again. Such variability calls for all-round excellence—speed, stamina, and adaptability. The late Steve Donoghue, the famous jockey, who rode four Derby winners there, described it as the fairest and yet severest test of the racehorse. The race is confined to three-year-old colts and fillies. Geldings used also to compete—Curzon, who ran second to Sir Visto in 1895, was one—but they are no longer eligible. Colts carry 126 pounds and fillies 121 pounds. Entrance fee is £100, half of which is saved if forfeit is declared a week before the race is run. If a horse is withdrawn three months before, three quarters of the fee is saved, while withdrawal twelve months before cuts the loss to £5. Admission to the course itself is free, charges being made only for admittance to the stands and enclosures. It is estimated that three quarters of a million people see the race, the greater part being massed inside the track—which is free—and at Tattenham Corner. Booths, gypsy caravans, and refreshment tents are set up indiscriminately; and thousands of sightseers camp out on the spot. During World War I and World War II, substitute Derbies were run at Newmarket, but these carried none of the carnival atmosphere associated with Epsom.

DERBY PORCELAINS. Porcelain making at Derby, England, began in the mid-18th century. Although the present enterprise, The Royal Crown Derby Porcelain Company, is not in direct line from the original venture, it is related through a chain of factories. Because of practically continuous operation, generations of trained porcelain potters, modelers and decorators have lived in Derby and carried on the porcelain making traditions as formed first by André Planché and then by William Duesbury.

Derby porcelains fall into nine periods. Examples of the seven before 1848 are ranked in varying degrees as collectible art objects. Rarest are the small cream jugs, dated 1750; least desirable the ornate and highly colored dinner services of the Bloor period. The nine periods and their dates are: Planché, 1751–1755; Pale Color, 1755–1760; Patch, 1760–1770; Derby-Chelsea, 1770–1784; Duesbury Father and Son, 1784–1795; Duesbury & Kean, 1795–1809; Bloor, 1809–1848; Small Factories, 1848–1876; and The Derby Crown Porcelain Company, Limited, 1876 to the present time.

The first man to make porcelains in Derby was André Planché, a Huguenot to whom is attributed the small cream jugs with raised strawberry motif, probably experimental pieces since

paste and glaze is unlike that used later. Planché began making figures, rather heavy for their size and of uneven glaze, about 1751 at the Cockpit Hill factory owned by John Heath, local banker. During the next four years Planché improved paste and glaze and by 1755 was decorating with distinctively pale colors. He was also making useful wares.

The factory was successful and had such a large output that an extensive auction sale was held in London in 1756. It included "figures, jars, sauce boats, services for desserts and a great variety of useful and ornamental porcelain after the best Dresden models." Two other events happened that year. William Duesbury, a London porcelain enameler, came to Derby and the factory was moved to Nottingham Road.

The decade of the Patch period, so called from small unglazed patches on the bases of pieces caused by small clay pads on which they rested during firing, brought no radical changes. Figures, mostly from Meissen models, were larger and mounted on scrolled bases. Chief decorations were cotton stem flowers and Oriental motifs. Useful wares continued to follow silver shapes.

In 1770 Duesbury and Heath bought the Chelsea factory. Both factories now shifted from Meissen to French models, especially those of Sèvres. Also the policy of leaving Derby pieces unmarked so that they might be sold as Meissen, Chelsea or Bow work ceased. The factory so prospered under William Duesbury's direction that he and Heath bought the Bow works in 1776, moving models and some of the workmen to Derby. About this time came the white unglazed biscuit figures simulating marble, done in the Sèvres style. Derby was the first English factory to make these. Three years later Heath disposed of his interest and Duesbury became sole proprietor of the Derby and Chelsea factories. During this Derby-Chelsea period useful wares were first made in the Sèvres manner. They and the figures were ornamented liberally with gilt and a wide range of colors. In 1784 the Chelsea factory was closed and models and workmen brought to Derby. Duesbury lived only two years after that and was succeeded by his son, William Duesbury II, who in 1795 made Michael Kean, a miniature painter and decorator, his partner.

The following year Duesbury died. Kean became manager and later married his former partner's widow. He directed the business until 1809. Useful wares were the chief production and followed the prevailing neo-classic style. Then, because of dissension between Kean and William Duesbury III, who had then reached his majority, the factory was sold to a former clerk and salesman, Robert Bloor. Early in the Bloor period the change from soft paste porcelain to bone china was made. It was the standard material for the ornately decorated dinner services made in large quantities but of indifferent modeling and ornamentation throughout this period.

In 1847 Bloor died and Thomas Clark, sculptor and ceramic painter who had married Bloor's granddaughter, became factory manager. He had little practical knowledge of it and sold the models and similar property to a Staffordshire firm. The factory was closed in 1848 and torn down.

Two small factories were opened by former employees. One lasted about a year; the other,

Locker & Company, continued until 1859. In 1850, Stevenson, Sharp & Company started a factory which became Stevenson & Hancock in 1859 and Sampson-Hancock in 1866. Finally in 1877, the Derby Crown Porcelain Company Limited began operations. In 1890 when Queen Victoria granted this company a royal warrant its name was changed to The Royal Crown Derby Porcelain Company, Ltd. It has continued to hold like warrants since then.

Some 30 different marks were used during the first century of Derby porcelains. Most of them included the crown device. The earliest was a crown above a script D, later elaborated by a pair of cross staffs with six dots inserted between crown and initial. Other variations included Duesbury's name and "Derby." About 1825 Bloor changed to an oval band with "Bloor" and "Derby" lettered on it. Marks of the small factories are buckled strap collars lettered with the company names except for Sampson-Hancock. They revived the early mark, adding the flanking letters S and H. The Royal Crown Derby Porcelain Company's mark is a coronation crown with "Royal Crown Derby" in an arc above and two script D's interlaced below.

Early Derby porcelains are of soft paste with pale cream or greenish translucence. The glaze has a satin-like feel. The enamel colors having sunk into it during firing add much to their beauty. The bone china of Bloor and later is very hard with smooth glaze and the decorative colors are clear and brilliant.

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THOMAS ORMSBEE.

DERBYSHIRE, dār'bī-shār, a north mid-land county in England; area 1,029 square miles. The county is noted more for its coal mining and manufacturing than for agriculture although about 70 per cent of the area is productively occupied. Oats, barley, potatoes and wheat are the principal crops, with dairy farming and pasture in the uplands. Its beautiful scenery and the numerous mineral springs attract tourists and health seekers. The Peak district is one of the most attractive in the kingdom—Kinder Peak rising to 2,088 feet and the Peak to 1,880 feet. The Trent and the Derwent are the principal rivers. Its chief minerals are coal, iron ore, lead, flour or Derbyshire spar, limestones, marble, zinc and elastic bitumen. Some of the industries of the county are malting and brewing, the manufacture of iron, silk and cotton goods; calico prints, agricultural implements, paper, hats, porcelain, various kinds of cloth, and vases, urns, etc., from the Derbyshire spar. Coal mining is an important industry and to transport the coal several canals and railroads cross the county. The principal towns are Derby and Chesterfield. Haddon Hall, the original of Martindale Hall in Scott's *Peveril of the Peak*, and Chatsworth, the seat of the Devonshire, are noteworthy historically and as architectural types. For parliamentary purposes the county is divided into seven constituencies, each returning one member. Pop. (1951) 826,336.

DERCETO, dēr-sē'tō, the Greek name of Atargates, a Syrian goddess, the principal female deity of the Philistines, widely worshipped at Ascalon. She was the female counterpart

of Dagon (q.v.), terminating like him in a fish. She was a nature goddess presiding over the principle of generation and fertility, corresponding to the later Greek goddess Aphrodite and the Roman Venus.

DERECSKE, *dě'rěch-kě*, Hungary, a market town in Hungary, in the county of Bihar. In the neighborhood are four lakes, from which, by evaporation, soda is obtained. Nearby is another lake, called Fingoto, celebrated from the earliest times for its baths. In the same locality pearls are found, which, though small, are equal in beauty to those of the East. Pop. (1920) 9,840.

DERELICT, any property abandoned, deserted or cast away in such a manner as to indicate by the owner that he has relinquished claim thereunto. The mere intention of abandonment does not constitute dereliction. A ship abandoned at sea either by consent or compulsion under stress of weather or other unforeseen conditions is not forfeited if any evidence is left thereon of the owner's intention to return when the stress is removed. The owner may recover on payment of salvage within a year and a day, otherwise the property is considered derelict. The same rule applies to goods thrown overboard.

DERENBOURG, *de-răn'boor'*, Hartwig, French Orientalist: b. Paris, 17 June 1844; d. 1908. He studied at Göttingen and Leipzig, pursuing Arabic later at the Paris École des Hautes Études. Engaged at the Bibliothèque Impériale to continue the preparation of the catalogue of Arabic manuscripts in 1879 he was appointed professor of Arabic and in 1886 professor of Islamism and the religions of Arabia at the École des Hautes Études. In 1880 he examined the Arabic manuscripts in the Escorial and other libraries in Spain (Vol. 1 of his Escorial catalogue appearing in 1884), and on his return was made assistant to the commission upon Semitic inscriptions at the Académie des Inscriptions et Belles-Lettres. He issued a number of valuable editions of Arabic writers and became a member of the Institute in 1900.

DERENBOURG, Joseph, French Orientalist: b. Mayence, 21 Aug. 1811; d. Bad-Ems, 29 Aug. 1895. Of a family distinguished for learning, whose original home was Derenburg in Saxony, after rabbinical studies in his early youth, he went first to Giessen and then to Bonn, where Freytag was his Arabic teacher, and from which he gained his doctorate in 1834. A few years were spent as private tutor in Amsterdam, when in 1838 he settled in Paris. In 1852 he became proofreader of Oriental texts at the Imprimerie Impériale, which position he resigned in 1879, owing to an affection of the eye. He was an active educational factor in French Judaism, and with wider fields of Oriental learning made noteworthy contributions, his erudite works proving mines of value for later scholars. For example, his 'Essai sur l'histoire et la géographie de la Palestine' (Paris 1867) shed much light on the history of the Jews in the time of Christ. He planned a complete edition of Saadia's works in Arabic and French, a large part appearing in his lifetime. He issued a second edition of S. de Saey's 'Séances de Hariri,' and collaborated

with his son Hartwig in his edition of Abu-la Walid, and of Saadia.

DE RERUM NATURA, *dě rā-rum nā-too'rā* ('On the Nature of Things'), a philosophical poem of about 7,500 hexameter verses, conceived and written in the grand style that is part of the epic form, and dealing with the physical constitution and environment of human life with a view to the emancipation of that life from the tyranny of superstition and of mean desire. The doctrines set forth are those of Epicurus, whom the author reveres as the savior of mankind. Of this author, Titus Lucretius Carus, we know practically nothing except through the revelation of his personality that is made in the poem itself. Saint Jerome, it is true, in his continuation of the Chronicle of Eusebius, says that Lucretius was born in 95 B.C., became insane through the effects of a love-potion, wrote in his lucid intervals "several books" which Cicero subsequently edited, and died by his own hand in his forty-fourth year. Every clause of this brief statement has been disputed and there is no general agreement as to the amount of truth that may be contained in it. It would seem, on the one hand, highly improbable that a poem should have been thus composed that exhibits on almost every page extraordinary acuteness of observation and reasoning. On the other hand, the passionate intensity which marks the style from beginning to end has suggested to many readers, as it did to DeQuincey, that the author was laboring under some abnormal strain, and the internal evidence is conclusive that the work did not receive final revision. But interesting as it would be to know something of the details of the poet's life, it is not likely that any such knowledge would materially change the idea that we have been able to form of him from his work. No poet was ever less autobiographical; no poet ever made a more complete revelation of his essential self. The greater part of the poem is concerned with the proof of the existence and character of the laws of the physical universe. Yet Lucretius is interested in physical science primarily because it alone provides the necessary foundation for his doctrine of ethics. Observing everywhere in the history of the Mediterranean world the sufferings of mankind due to belief in the power of anthropomorphic and capricious deities, he set himself the task that modern science has in fact accomplished, to prove that the reign of law is universal, that given causes produce given effects, and that no arbitrary interposition of an external power can modify in the slightest degree the chain of causation. It follows that man is master of his fate, that neither in this world nor in the next (for, the soul being atomic, there is no next) can the gods affect his life in any way for weal or for woe, and that therefore, if only he is willing to achieve knowledge of nature and control of himself, he may order his thought and action according to the dictates of reason and thus live a life "that is worthy of the gods." For though they have no power, the gods do exist. Somewhere in the interstellar spaces is their seat and there in "passionless tranquillity" they incarnate Epicurean perfection. No aspect of the poem is more striking or more engaging than the enthusiasm with which Lucretius dwells upon this

conception of universal law and supports it by a literally amazing variety of evidence. The poem shows, in fact, that he had to an extent that is surprising in a disciple of Epicurus a passion for knowledge for its own sake. But his supreme interest was, after all, in the nobility of feeling, thought, and action that this rational understanding of nature's processes brings at last within the reach of men. Simplicity of living, riches gained not by increase of possessions, but by diminution of desires, contentment found in fundamental human relationships, a life, in brief, devoid of ambition and largely contemplative, such an ordering of existence even in a world whose laws are, on the whole, austere, will gain for man real happiness, and, at the worst, such happiness as is possible under the circumstances. The facts of life and, equally, the fact of death, must be faced uncompromisingly if man is to retain his self-respect. Rational beings will seek, therefore, a possible, not an impossible, happiness.

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DE RESZKE. See RESZKE, EDOUARD DE; RESZKE, JEAN DE.

DERG, LOUGH, lõk dũrg', (1) a lake in Ireland, c.23 miles long, 1-5 miles in width, which is an expansion of the Shannon River, and located between counties Galway, Clare, and Tipperary; (2) a lake, situated in county Donegal, includes Station Island, a center of pilgrimage.

DE RIDDER, dě rĩd'ēr, city, Louisiana, seat of Beauregard Parish, is located at an altitude of 205 feet in southwestern Louisiana. The city's transportation system is supplied by the Kansas City Southern, the Atchison, Topeka, and Santa Fe, and the Southern Pacific railroads, and by U.S. interstate highways. It lies 50 miles north of the city of Lake Charles and about 235 miles northwest of New Orleans.

De Ridder is primarily an agricultural and livestock raising community. The city was incorporated in 1907, and has a commission form of local government. Pop. (1950) 5,776.

DERMAPTERA, dēr-măp'tēr-ă, an order of insects (formerly classified as a family, Forficulidae, of the order Orthoptera), includes the earwigs and arixenids. See EARWIG.

DERMATITIS, -tĩ'tis, a name given to certain inflammations of the skin, characterized by form and arrangement of pathological changes in the skin rather than from their cause. These causes may act from within or without. The change taking place is some form of erythema, with the usual heat, redness, and swelling symptoms. Thus, there are found dermatitis traumatica, the general or local condition caused by a wound or injury, such as a blow, pressure, or friction; dermatitis calorica, resulting from burns and scalds; X-ray dermatitis (d. skiagraphica);

dermatitis venenata, a type of contact dermatitis, caused by the local action of irritants, usually plants, and also by animal, vegetable, or mineral poisons, such as poison ivy, nettle, aniline dyes, strong acids and alkalis, arnica, and others; dermatitis medicamentosa, skin eruptions following the use of certain drugs, as antifebrin (acetanilid), antipyrine, belladonna, bromides, iodides, and others. There may also be a dermatitis after vaccination or poisoning in the wound. See also SKIN AND SKIN DISEASES.

DERMATOLOGY, -tĩl'ō-jĩ, the branch of medical science which treats of the skin, its structure, functions, and diseases, and their diagnosis and treatment. See also SKIN AND SKIN DISEASES.

DERMATOPHYTE, dũr'mă-tĩ-fit', is a vegetable microparasite; specifically, a fungus microorganism pathogenic to man; or any fungus parasitic upon the skin of man, or of animals.

The dermatophytes are a group of fungi which invade the superficial skin, and they are now divided into three genera of fungi: *Microsporum*, *Epidermophyton*, and *Trichophyton*. The former practice was to classify dermatophytes according to the type of lesion from which they were isolated, but the current method is based, rather, on morphological features relating to the form or structure of the microorganisms.

Of these dermatophytes, the genus, *Microsporum*, produce only diseases of the hair and the skin, *Epidermophyton*, of which genus only one species (*Epidermophyton floccosum*) has been identified, causes dermatophytosis (or dermatomycosis), commonly known as ringworm (tinea); and *Trichophyton*, a genus which attach to the hair, skin and nails and are common allergens, result in a condition called dermatophytosis, a skin eruption, with scaling and cracking, sometimes with secondary infection.

DERMESTES, dēr-mēs'tēz, an important genus of the family Dermestidae, consisting of skin beetles, hide beetles, tallow beetles, and dermestids; the Dermestidae belongs to the superfamily Dascilloidea, of the suborder Polyphaga, of the order Coleoptera (insects whose fore-wings, or elytra, are thickened, hard, and of a horny quality, and serve as a protective sheath for the posterior pair of wings, which are membranous and, when not in flight, folded in a complex fashion under the elytra).

Three species of the genus *Dermestes* are: *D. cadaverinus*, *D. lardarius*, and *D. vulpinus*. These are all very destructive, cosmopolitan in habitat, about 7-9 mm. in length, vari-colored black and white, and covered with hairs. Both the larvae and the adults of the Dermestes beetles feed upon dead vegetable and animal matter, especially on skins, horn, hair, wool, tallow, cheese, and museum insect specimens; stuffed animals, furs, woolen clothes, and carpets must be protected from them by chemical treatment, or other special measures.

The species, *D. vulpinus* (leather beetle) is of value to museums to clean bones of dried flesh because it feeds primarily upon animal skins, while the species *D. lardarius* (larder beetle), c.¼ inch in length, has mouth parts adapted for chewing.

Consult Essig, E. O., *College Entomology* (New York 1947).

DERN, dürn, **George Henry**, American mining executive and political leader: b. Dodge County, Nebr., Sept. 8, 1872; d. Washington, D.C., Aug. 27, 1936. He attended the University of Nebraska, and in 1894 moved to Utah, where he engaged in various mining enterprises with conspicuous success. He was coinventor of the Holt-Dern ore roaster, used in processing silver, and other ore-refining processes. After serving in the Utah Senate from 1915 to 1923, he was elected governor of the state in 1924 and again in 1928. At the end of his second term he was appointed (1933) secretary of war by President Franklin D. Roosevelt, and served in that office until his death.

DERNA, dër'nà (sometimes **DERNE**, dërn), town, Libya, in the division of Cyrenaica, 60 miles northeast of Bengasi. Situated on the Mediterranean coast, in a small fertile plain, it is a popular winter resort and a trading center of some importance in the local economy, receiving wool and leather from the inland regions and dealing in fish and varieties of fruit produced in palm gardens. There are distilleries, limekilns, and soap factories in the area.

Lying on the coastal road between Bengasi and Tobruk, Derna was repeatedly the scene of combat during the North African campaigns of World War II, the British taking it initially from the Italians in January 1941, after a tank battle and five days of fighting. While none of the subsequent engagements at Derna were as destructive as the first, the town was twice captured by the German forces of General Erwin Rommel before being finally secured by the British late in 1942.

The Italians had administered Derna as a part of their Libyan colony since 1911 when 75 years of Ottoman rule in the area were ended. Prior to its use as a base of Turkish power, it had been controlled by a succession of Tripolitan pashas and had figured in the war between the United States and Tripoli (1801-1805) over the depredations of the Barbary pirates (see also **DERNA EXPEDITION**). Pop. (1950) 20,782.

DERNA EXPEDITION, an episode in the war between the United States and Tripoli (1801-1805), which had started when the Tripolitan pasha demanded increased tribute for the protection of American merchant shipping in the Mediterranean Sea. In an effort to end the war quickly, William Eaton (q.v.), former American consul to Tunis, undertook late in 1804 to lead an expedition to depose Yusuf, pasha of Tripoli, and replace him with his older brother Hamet, who had been driven from power some thirteen years earlier. Eaton was given the title of navy agent to the Barbary States, and proceeded to muster an army of some 600 Arabs, Greeks, and Americans in Alexandria. He then marched 500 miles across the Libyan desert to Derna, Yusuf's eastern outpost. With the support of a naval squadron, he stormed and took the town on April 27, 1805, and installed Hamet as ruler. Though Eaton succeeded, with the aid of naval gunfire, in holding Derna against repeated counterattacks by the forces of the pasha, he was not able to complete his ambitious plan of marching against Tripoli, some 700 miles away. Before he could set out, the episode was brought to a close on June 4, 1805, when Tobias Lear, American consul general for Algiers, concluded a treaty with

Yusuf which ended the brief rule of Hamet at Derna, ransomed American captives at Tripoli, but did nothing to prevent the future repetition of piratical acts. The issue was not finally settled until 1815 after the successful conclusion of the war with Algiers. See also **BARBARY WARS**.

DERNBURG, dërn'büörk, **Bernhard**, German statesman: b. Darmstadt, Germany, July 17, 1865; d. Berlin, Oct. 15, 1937. Of Jewish extraction, he received a commercial education and as a young man came to America and engaged in the banking business, acquiring a good knowledge of the English language. In Germany, in 1906, he was appointed director of the colonial office and during his four years' tenure succeeded in developing the resources of the German colonies. At the beginning of World War I he was sent to the United States to aid Count Johann-Heinrich von Bernstorff in attempting to win American friendship. He directed a press campaign and published Germany's peace conditions in 1915, declaring that there was nothing in the German program "which would not be beneficial to the rest of the world, especially the United States." After the war he was a leader of the Democratic Party in Germany, a member of the Reichstag, and minister of finance in Philipp Scheidemann's cabinet (1919). He published *Zielpunkte des deutschen Kolonialwesens* (1907).

DE ROSSET, **Moses John**, American physician: b. Wilmington, N. C., July 4, 1838; d. New York, N. Y., May 1, 1881. He studied in Switzerland and Germany, received a medical degree from the University of the City of New York in 1860, and during the Civil War served with distinction as a surgeon in the Confederate Army. After the war, in Baltimore, Md., he became professor of chemistry at the University of Maryland medical school and began to specialize in diseases of the eye and ear, to the study of which he made some significant early contributions. His last years were spent in Wilmington, N. C., and New York City.

DEROULEDE, dā-rōō-léd', **Paul**, French poet and politician: b. Paris, France, Sept. 2, 1846; d. Mont-Boron, Jan. 30, 1914. He fought in the Franco-Prussian War as a private and emerged from it with burning hatred for the German victor. His popular *Chants du soldat* (1872), followed by similar collections in 1875, 1882, 1888, and later, were intended to fan the French desire for *revanche*. So were his dramatic evocations of past military prowess (*Messire du Guesclin*, 1895; *La Mort de Hoche*, 1897), and the foundation of the Ligue des Patriotes (1882), a nonpolitical organization of which he became president. However, when Déroulède undertook to translate a poet's dream into practical politics, the unrealistic quality of his nationalism became thoroughly apparent. He tried to rally his followers around the seditious General Georges Boulanger, a move which led to much turmoil and to the suppression of the Ligue in 1889. He was elected the same year to the Chamber of Deputies, but was expelled soon thereafter for disorderly interruptions during debate. Reelected in 1898, he attempted, on the very day of the funeral of President François Félix Faure (Feb. 23, 1899), to foment a subversive march upon the Elysée Palace. Arraigned before the High Court for

conspiracy against the republic, he stood two successive trials and was finally condemned to ten years' banishment (Jan. 4, 1900). The sentence was commuted in 1905 under a general amnesty. Upon his return to France, Déroulède published *Feuilles de route* (1907), a volume of reminiscences.

Consult Tharaud, Jérôme and Jean, *La Vie et la Mort de Déroulède* (Paris 1925).

JEAN-ALBERT BÉDÉ.

DERRICK, dēr'ik, a mechanical device for lifting and shifting heavy weights. The simplest form of derrick is the gin, a tripod of three legs, with a compound pulley at the apex and another at the hoisting hook and a windlass to operate the pulley rope. These simple derricks are easily portable and are used very commonly for lifting stones, pulling stumps, lowering iron pipes into trenches and similar work. The builders' derrick has two legs framed together like a broad ladder and set wider apart at the bottom than at the top. The foot piece at the bottom is fitted with wheels which run sideways along a plank parallel to the face of the building. The top of the derrick is inclined toward the building and is held in position by guy ropes. This form of derrick is used by stone masons to lift and set in place stone facing, sills, lintels, and columns. It is sometimes footed on a beam of an upper story, hanging outward over the street, and is used to hoist materials.

For large and heavy work, as in excavations and the erection of steel-frame buildings, the derrick in common use is the guy derrick, comprising a mast held upright by four to seven guys widely extended and securely anchored, and a boom attached to the mast near the bottom by a hinged joint, so that it may rise and fall in a vertical plane, the whole having the outline of a V. The foot of the mast is a pivot pin set in an opening in a heavy base plate, or, in very large derricks, a ball and socket joint. The guys at the top are attached to a thick circular plate which slips down on a gudgeon pin. The mast is thus free to revolve, and if the derrick is small, it is swung by means of a horizontal pushing bar; if large, the base of the mast is fitted with a bull wheel, from five to eight feet in diameter, which is operated by cable from a winding engine. Derricks are usually equipped with two separate hoists, one lifting the load and the other drawing in the guy ropes which control the sag of the boom away from the mast. The winding drums which do this work are generally detached from the derrick itself, but in some cases the winding machinery is built on a platform attached to the base of the mast and revolves with it upon a cogged circular track.

In confined situations, as between buildings in cities, where there is insufficient room to stretch guys to support the mast, the stiff-leg derrick is used. In this device, the mast is held at the top by two struts which descend at an angle of 45° and are hinged to the ends of two heavy beams, spread at a 90° angle and secured at the base of the mast. These timbers are weighted or bolted down as circumstances permit. Similar to the stiff-leg derrick, the jinniwink derrick, favored by building contractors for its lightness and the ease with which it can be set up, replaces the mast with a frame in the shape of an inverted V. It has a single back strut, the whole mounted on a T-shaped base to which the boom is hinged.

A heavier device used in building construction is the tower derrick, consisting of a guyed square tower, usually of latticed structural steel, with footings which permit the shifting of a counter-weighted boom to higher or lower positions as needed. See also CRANE.

DERRIS, dēr'is, a genus of tropical woody vines of the family Fabaceae. The best-known species, *D. elliptica*, yields a toxic yellow resin called derride, which is used in insecticides.

DERRY, dēr'i, town, New Hampshire, in Rockingham County, about ten miles southeast of Manchester. It was incorporated in 1827, though settled much earlier by Scotch-Irish immigrants. A center of the linen industry in the early 19th century, the area's economy has more recently depended on the manufacture of shoes and textiles. Annual horse races on ice have been held there since 1928. The poet Robert Frost once lived in Derry and taught at the Pinkerton Academy. Pop. (1950) 5,826.

DERVISH (Persian DARVISH), the Persian equivalent of the Arabic fakir (*faqīr*). See FAKIR.

DERWENT, dūr'wënt, the name of four English rivers and one river in Tasmania:

(1) A river in Derbyshire, in north central England, with a length of about 60 miles. It joins the Trent near Derby and is unusually scenic.

(2) A river in Cumberland, in northwest England, about 33 miles long, emptying into Solway Firth in the Irish Sea.

(3) A river in Northumberland and Durham, in northeast England, 30 miles long, flowing in a northeasterly direction into the Tyne.

(4) A river in Yorkshire, England, rising in high ground not far from the North Sea and flowing some 57 miles southward to join the Ouse below York.

(5) A river on the island of Tasmania, south of Australia. Its source is Lake St. Clair, near the center of the island, and its mouth is at Hobart, the capital. An estuary below the city extends into Storm Bay. The river is 130 miles in length but only the estuary is navigable.

DERWENTWATER, dūr'wënt-wō-tēr, 3d Earl of (SIR JAMES RADCLIFFE or RADCLYFFE), English Jacobite nobleman: b. London, England, June 28, 1689; d. there, Feb. 24, 1716. His grandfather, Francis, was created earl of Derwentwater by James II in 1688, and his father, Edward, the 2d earl, married the daughter of Charles II by Moll Davis, the actress. James Radcliffe succeeded to the title in 1705.

A Roman Catholic with close ties to the Stuarts, he took part in the attempt of 1715 to restore that family to the throne of England. He joined the Scottish rebels at the head of an English contingent, and shared their defeat at Preston in Lancashire on Nov. 13, 1715. He was beheaded on Tower Hill for high treason and his estates in Northumberland confiscated and given in part to Greenwich Hospital. His execution was widely mourned, and his name still survives in some of the folksongs of northern England.

DERWENTWATER or **DERWENT WATER** (also called KESWICK LAKE), a beautiful lake in Cumberland, England, in the vale of

Keswick. It is about three miles in length and one mile in breadth, and stretches from Skiddaw on the north to Borrowdale. Near the northeast corner is the celebrated Falls of Lodore. Its waters are carried to the sea by the Derwent River.

DERZHAVIN, dyēr-zhā'vyīn, **Gavriil Romanovich**, Russian lyric poet: b. Kazan, Russia, July 14, 1743; d. near Novgorod, July 21, 1816. He was of Tatar descent, and his schooling was limited. At 19 he began a military career, but it was not until his entry into the civil service, in which he rose to high posts under Catherine the Great, that his poetic talent was recognized. He became successively governor of Olonets (1784) and of Tambov (1785), and state secretary to Catherine (1791). In 1802 Alexander I made him minister of justice, and the following year he was permitted to retire on full pay.

During Catherine's reign, which ended in 1796, he was the favorite court poet, and he is now considered by many to be the outstanding Russian poet before Pushkin. This high critical estimate is based on the qualities of realism which he introduced into his work and on the great richness, variety, and rhythmic power of his odes, the best known of which was the *Oda Bog* (*Ode to God*, 1780-1784). This widely translated work, extraordinary for its aptness of thought and expression, was undertaken as an answer to the skepticism and agnosticism then gaining ground through the influence of French philosophy. See ODE TO GOD, THE.

DESAGUADERO, dās-ā-gwā-thā'rō, river, Bolivia, the only outlet for the waters of Lake Titicaca. It leaves the lake at the village of Desaguadero and runs southeastward for about 200 miles, emptying into Lake Poopó, a large, shallow, marshy body of water. It is one of the highest rivers in the world, running its entire course at an elevation of over 12,000 feet. It is navigable, but only for small craft, the larger steamers of Lake Titicaca being confined to the lake itself. Even so, the central location of the Desaguadero on the Bolivian high plateau makes it an adjunct to the system of roads and railways that links the silver- and tin-mining areas of Oruro and the copper mines of Corocoro with the capital, La Paz, and the transport facilities leading to the outside world through Argentina and Brazil. Though the river runs into salt marshes in its lower course, its upper waters are used in irrigation.

DESAGULIERS, dā-zā-gū-lyā', **John Theophilus**, English natural philosopher and inventor: b. La Rochelle, France, March 13, 1683; d. London, England, Feb. 29, 1744. Brought to England as a child by his father Jean Desaguliers, a French pastor seeking refuge after the revocation (1685) of the Edict of Nantes, he assisted his father at a school in Islington and took a B.A. degree at Christ Church, Oxford. He became a deacon in 1710 and was appointed lecturer in experimental philosophy at Hart Hall. In 1714 he was elected to membership in the Royal Society and became a demonstrator and curator of that body.

Throughout the remainder of his life he continued to lecture on natural philosophy, usually at his home in London, using experiments to illustrate his points, and attracting general audi-

ences to whom scientific lectures had seldom, if ever, before been available. His work won the praise of Sir Isaac Newton, who was president of the Royal Society from 1703 to 1727. Desaguliers also invented a "planetarium" for determining the distances between the planets and stars according to Copernican and Newtonian principles; a ventilator, installed in a room in the Parliament building; and a process for applying steam in manufacturing operations.

His youngest son, **THOMAS DESAGULIERS** (1725?-1780), followed a different career to achieve his own measure of distinction. He served from a very early age in the Royal Artillery, and engaged in a number of battles on the Continent, returning to England in 1748 as a captain. Appointed chief firemaster at Woolwich, he became the first scientific maker of cannon in the English army. In 1761, in an expedition against the French island of Belle-Île-en-Mer, Desaguliers, who held the temporary rank of brigadier general, mounted a battery that pounded the citadel with an artillery barrage such as had never been seen before. His investigations at Woolwich continued in the field of mortars, rockets, and ballistics until the end of his life. He was elected to the Royal Society in 1763, the first Royal Artillery officer to receive the honor.

DESAIX DE VEYGOUX, dē-zē' dē vā-gōō', **Louis Charles Antoine**, French general: b. St.-Hilaire-d'Ayat, near Riom, France, Aug. 17, 1768; d. Marengo, Italy, June 14, 1800. Having entered the army at 15, he was in 1792 appointed aide to Victor Claude de Broglie, commander of the Army of the Rhine. He was promoted to the command of a brigade in 1793, and of a division the following year. In 1796-1797 he won wide acclaim for his heroism during Jean Victor Moreau's famous retreat through the Black Forest. In the ruined fortress of Kehl, near Strasbourg, Desaix resisted the Austrian army for more than two months, capitulating only in January, 1797, when his ammunition was spent.

He served with Napoleon (1798-1799) in Egypt, where he again distinguished himself and was appointed governor of the upper part of the country. He completely subdued Upper Egypt and received, as testimony of admiration from Bonaparte, a sword with the inscription "Conquête de la Haute Égypte" on its blade. He ingratiated himself with the Egyptians and came to be known to them as the "Just Sultan." He was nevertheless obliged, in 1800, to sign the unfavorable treaty of El'Arish with the Turks and English. On his way back to France he was captured and detained by the English as a prisoner of war, but was soon released. He arrived in Italy just in time to take an important and perhaps decisive part in Napoleon's defeat of the Austrians at Marengo but was killed during the engagement.

DE SANCTIS, dā sāngk'tēs, **Francesco**, Italian statesman, literary historian, and critic: b. Morra Irpina, Avellino, Italy, March 28, 1817; d. Naples, Dec. 29, 1883. He received his schooling in Naples and, from 1838 to 1848, conducted a private school of literary studies where he continually emphasized a liberal, partisan attitude toward the social and political issues of the day. His activity in support of the unsuccessful revolution of 1848 in Naples, in which he was joined by many of his students, resulted in his imprison-

ment by the Bourbons. On his release he joined a group of liberals in Turin where, in 1854-1855, he took part in working for the unification of Italy. Appointed professor of literature at Zurich, Switzerland, in 1856, he built a considerable following through his lectures. He returned to Naples in 1860 at the time of Giuseppe Garibaldi's entry into that city and became the governor of his native province of Avellino. During 1861, he was minister of education in the cabinet of Conte Camillo Benso di Cavour, a post to which he returned twice between 1878 and 1881.

Meanwhile, he served as professor of comparative literature at the University of Naples for seven years, beginning in 1871.

De Sanctis' greatest fame rests in his extraordinary qualities as a literary critic. His method reversed the accepted historical approach in criticism. It was his habit to proceed from an initial consideration of the work of art as an independent whole, examining its immediate impression on the reader before studying the historical context in which it was produced. His powers of analysis and synthesis and his strong, engaging personality made him an outstanding teacher. His most influential published works were his *Saggi critici* (1866), *Storia della letteratura Italiana* (1871; Eng. tr. 1931), and *Nuovi saggi critici* (1872).

DESARGUES, dā-zārg', **Gérard**, French mathematician: b. Lyon, France, 1593; d. there, 1662. His early life is obscure, but it is known that he was a soldier, a military engineer, and later an architect. After the siege of La Rochelle (1627-1628), where he met René Descartes, he devoted himself to the study of mathematics. He collaborated with Blaise Pascal in formulating the basic rules of synthetic projective geometry, introducing the theory of perspectives. This method of approach was not earnestly taken up by others until nearly 200 years after his death. He studied conic sections as projections of a circle and was responsible for theories on involution and transversals. He elaborated the concept of the straight line as a curve closed at infinity and defined parallels as lines that intersect at infinity. His writings on perspective and conics were believed lost until their discovery and republication in 1864.

DESAUGIERS, dā-zō-zhyā' **Marc Antoine**, French composer: b. Fréjus, France, 1742; d. Paris, Sept. 10, 1793. His light operas had a great vogue in Paris between 1780 and the time of his death. Among them was a musical adaptation of Molière's comedy, *le Médecin malgré lui* (1792). He also wrote a cantata, *Hiérodrama*, celebrating the fall of the Bastille in 1789.

His son, **MARC ANTOINE MADELEINE DESAUGIERS** (b. Fréjus, Nov. 17, 1772; d. Paris, Aug. 9, 1827), left France at the beginning of the revolution and lived for a time in the United States. He returned to France in 1797 and became a popular songwriter, vaudevillian, and manager of Parisian variety theaters, including (from 1815) the Théâtre du Vaudeville.

DESAULT, dē-sō', **Pierre Joseph**, French surgeon: b. near Lure, France, Feb. 6, 1744; d. Paris, June 1, 1795. He studied medicine with a private practitioner in Belfort and in 1762 went to Paris, where he was appointed surgeon at l'Hôpital de la Charité in 1782 and at the famous

Hôtel-Dieu in 1788. At the latter he founded a surgical school which was to produce many of the foremost surgeons of the time. He introduced the clinical method of instruction in France and conducted lectures which were attended by hundreds of students, foreign as well as French. Desault also developed new instruments and new surgical techniques. After his death he was falsely accused of having hastened the death of Louis XVII in prison. His scientific writings were published by his pupil and collaborator François Xavier Bichat as *Oeuvres chirurgicales* (1798-1803).

DESBARRES, dā-bār', **Joseph Frederick Walsh or Wallet**, English military engineer and hydrographer: b. probably in Switzerland, 1722; d. Halifax, Nova Scotia, Canada, Oct. 24, 1824. Of Huguenot descent, he attended the Royal Military College at Woolwich, England, and in 1756 went to America as a lieutenant in the English army, raising, and for a time commanding, a corps of field artillery. In 1757 he gained a victory over the Indians who had attacked Fort Schenectady, and at the siege of Quebec (1759) was aide-de-camp to General James Wolfe, who is said to have fallen mortally wounded while Desbarres was making a report. He conducted the engineering operations of the English army during the subsequent conquest of Canada, and was quartermaster general in the expedition that retook Newfoundland in 1762.

Between 1763 and 1773, Desbarres made an exhaustive hydrographic survey of the coast of Nova Scotia, often risking his life to get difficult soundings. He was afterward engaged by Lord Richard Howe to prepare charts of the North American coast as far as the Gulf of Mexico, a labor which was to occupy another 16 years of his life. He was lieutenant governor of Cape Breton (1784-1805), and of Prince Edward Island (1805-1813). He published the *Atlantic Neptune* (1777), which incorporated his own surveys and those of others, a book of lasting value to mariners, containing numerous charts and plates of extraordinary quality. He died in Canada at the age of 102.

DESBORDES-VALMORE, dā-bôrd' vāl-môr, **Marceline Félicité Joséphe** (nee DESBORDES), French poet: b. Douai, France, June 20, 1786; d. Paris, July 23, 1859. Her childhood was difficult and unhappy, her family having been ruined by the revolution in France, and she went on the stage at an early age in order to make a living. In 1817 she married an undistinguished actor, named François Lanchantin, whose stage name Valmore she added to her own; and in the face of many hardships she remained a devoted wife and mother. Soon after her marriage she began to publish volumes of verse which, despite its artistic imperfections, was impressive for its sincerity, simplicity, and musical quality. In the latter characteristic particularly her poetry resembled the work of the famous poet of the next generation, Paul Verlaine, who acknowledged his debt to her writings. Among her volumes of verse were *Élégies et Romances* (1818), *les Pleurs* (1833), *Pauvres Fleurs* (1839), and *Bouquets et Prières* (1843).

DESBOROUGH or **DESBOROW**, dēz'-bū-rū, or **DISBROWE**, diz'brō, **John**, English soldier: baptized at Eltisley, Cambridgeshire,

England, Nov. 13, 1608; d. Hackney, Middlesex, 1680. Having married Oliver Cromwell's sister, he enlisted on the Parliamentary side in the war against the Stuarts, rising to the rank of major general by the time of the Battle of Worcester (1649). Following the battle he nearly captured the future Charles II near Salisbury. During Cromwell's ascendancy Desborough received increasingly important posts and finally entered the Protector's Privy Council in 1657. He opposed the plan to have Cromwell assume the crown, and at the latter's death had sufficient power to force his successor, Richard Cromwell, to dissolve Parliament and restore the Rump (1659), which elected him a member of the Council of State. Desborough proceeded, however, to intrigue with other leading officers to replace the rule of Parliament with a military dictatorship.

After the Restoration Desborough managed to escape to Holland, where he strove for a number of years to rally the remnants of the English republicans. He returned to England in 1666 and, after a brief imprisonment, was allowed to retire to Hackney. He was lampooned in Samuel Butler's *Hudibras* and other anti-Puritan satires of the time.

DESCARTES, dā-kärt', René, French philosopher and mathematician: b. La Haye, Touraine, France, March 31, 1596; d. Stockholm, Sweden, Feb. 11, 1650. His mother having died the year after his birth, he was raised by his grandmother and sent, at the age of eight, to the Jesuit College at La Flèche, in Anjou, where he was taught Latin, history, and some poetry. This was followed by the study of philosophy, comprising logic, physics, mathematics, and finally Aristotelian metaphysics and ethics. Although fond of his professors, he tells us in his *Discours de la méthode* (1637) that when he left college he felt that there had been much futility and verbiage in his studies.

In 1616 he was apparently studying medicine at Poitiers, where he also took a law degree. He then went to Holland and enlisted in a French regiment under the command of Maurice of Nassau. While in that country he became acquainted with the Dutch mathematician Isaac Beeckman, and it would seem that he was studying various problems of physics and mathematics throughout his term of military service. After traveling in Central Europe, he spent the last months of 1619 in winter quarters near Ulm in deep meditation and on November 11 had a complex dream which he interpreted as a sign that he was destined to establish the unity of science. It was probably at about this time that he was beginning, through constant skepticism and re-examination, to reduce all philosophical theory to the small kernel of certainty that he found in the concept: "I think, therefore I am."

He returned to France in 1622, and shortly thereafter went to Italy, where he stayed for about 18 months. Returning again to Paris, he lived and worked there for two years, keeping in touch with the best-known scientists of the period, and beginning a work entitled *Regulae ad directionem ingenii* (*Rules for the Direction of the Mind*, not published until 1701), a first sketch of his *Discours*. From the fall of 1628 to the end of 1649, with the exception of trips to France in 1644, 1647, and 1648, he lived in Holland, never staying very long in one place but maintaining contact with many scientists, philosophers, theo-

logians and professors. During the first nine months of this period of residence in Holland he methodically put his metaphysical thoughts in order, but he apparently intended, as a first step, to publish his theories of physics, which were purely mechanistic. He was working on the *Traité du monde ou de la lumière* (*Treatise on the World or on Light*), which was to include the *Traité de l'homme* (*Treatise on Man*), when he heard of the examination and condemnation of Galileo Galilei in Rome by the tribunal of the Inquisition (1633).

Since his own system of physics accepted several tenets of Galileo's thought, he decided to abandon the preparation of his general treatise, and concentrated instead on his *Discours de la méthode*. This celebrated work consisted essentially of a description of the principles of thought which, he believed, could lead mankind to the establishment of a universal science capable of enhancing human progress. It was amplified by three scientific essays (*la Dioptrique*, *les Météores*, *la Géométrie*), given as examples of results obtained by his method. The methodological approach served him particularly well in the field of pure mathematics, and he is given credit for founding the science of analytical geometry. His next work, a Latin treatise called *Meditationes de prima philosophia* (1641), was concerned with proofs of the existence of God and the dualistic separation of mind and matter, and drew him into endless controversies with theologians and philosophers. He made another systematic exposition of his views in *Principia philosophiae* (1644).

He had begun, in 1642, an erudite correspondence with Elizabeth, eldest daughter of the exiled elector palatine, in which he treated several problems of ethics and metaphysics. Some of the questions raised in this correspondence (not published until 1879) were developed in *Les passions de l'âme* (*The Passions of the Soul*, 1649). By the time of the publication of that book, Descartes was in Sweden, where he had been invited by the young queen, Christina, to instruct her in his philosophy. She required that her lessons be given at 5:00 A.M. and had apparently taken only a very few when Descartes contracted pneumonia and died after nine days' illness. For Descartes' philosophy see **CARTESIANISM**.

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JEAN BOORSCH,
Professor of French, Yale University.

DESCARTES' RULE OF SIGNS, a theorem by which the maximum number of positive or negative roots of an equation can at once be detected on sight. The theorem may be stated thus: The number of positive roots of an equation cannot exceed the number of variations in the signs of its coefficients, con-

sidered in their proper order. A fair example is the cubic equation: $F(x) = 3x^3 - 7x^2 + 11x + 4 = 0$. Here are but two variations of signs on passing from one extreme term to the other, through the intermediate ones; we conclude therefore that the cubic cannot have more than two positive roots. The maximum number of negative roots is seen on applying the same theorem to the equation which is obtained from the original by changing x into $-x$. Thus the positive roots of $F(-x) = 3x^3 + 7x^2 - 11x + 4 = 0$ are negative roots of the original cubic, and by Descartes' rule cannot exceed three.

DESCENDANTS, as a term of law, is applied to the issue of a person, or the offspring of such issue, as sons, daughters, grandsons, and granddaughters related in a direct line to the farthest generation. Such descendants have a prior claim over ascendants or collateral relatives in the inheritance of property of a deceased ancestor. In cases of intestacy these descendants now inherit both real and personal property pursuant to established rules of law described in the various states either as inheritance or estate laws. These laws may involve the rights of a surviving spouse, marriage settlements, courtesy, dower, half-blood relatives, illegitimate or posthumous children. In the absence of a will by the decedent, the transmission of property on death is vested in the authority of the state legislature.

See also DESCENT AND DISTRIBUTION; HEIRS; INTESTACY.

DESCENT AND DISTRIBUTION, in law. Descent is the hereditary succession to the title to real property on the death of a person dying intestate. His personal property is distributed by his administrator to his next of kin according to the statutes of distribution of the state of the domicile of the decedent. Under common law, real property descended to heirs at law and such descent was predicated by operation of law, while personal property was divided among those legally entitled thereto as distributees.

Historically, the law of descent of real property is based on feudal grants and tenures and on old rules of law called canons of descent. Under old English law, real property could descend only, and never ascend. It descended only to the eldest son, and was known as the rule primogeniture. Estates tail were an exception to the law of descent. Such estates were created by limited grants as to a man and the female heirs of his body. The real property in such cases descended according to the grant. In the United States, some of the states have passed laws by which any words used in the granting of an estate which would create an estate tail shall be considered as creating an estate in fee simple, and by this means have abolished estates tail. The abolition of the rule of primogeniture and the conversion of estates tail into estates of fee simple were accomplished at the birth of the United States largely through the efforts of Thomas Jefferson. This was a radical change from English jurisprudence.

In Great Britain, by the Law of Property Act, 1922-1925, which went into effect Jan. 1, 1926, the heir at law disappears and both real and personal estate devolve upon intestacy in the same way.

In many of the states there is a wide distinction between the laws of descent and those of distribution. These laws differ materially, and it is therefore necessary to examine with care the statutes of any particular state in order to determine its rule on this subject.

The general rule in the United States seems to be that real estate, subject to the rights of the surviving spouse, descends to children, grandchildren, and on down in the lineal line; in default of these heirs, then to parents, and, if they are dead, the estate goes to collaterals; and if there are no heirs, to the state. In only a few states are the husband and wife placed in the line of inheritance. The law of the place where the real estate is situated is the law according to which the estate passes to the heir; and it makes no difference where the decedent was domiciled. See also HEIR; INTESTACY.

HUGH NEHRING.

DESCENT OF MAN AND SELECTION IN RELATION TO SEX, The, is a work by Charles Darwin (q.v.), published in 1871 (rev ed., 1874), wherein he applies the doctrine of the evolution of species to the origin of man. It consists of two parts, the first on the pedigree of mankind, the second on sexual selection in the animal kingdom generally. Darwin reasons that the early ancestors of man must have been more or less monkey-like animals of the great anthropoid group, and related to the progenitors of the orangoutan, the chimpanzee, and the gorilla, and that his much remoter ancestors must have been aquatic. See also DARWINIAN THEORY.

DESCHAMPS, dā-shān', Eustache (called MOREL), French poet: b. Vertus, Champagne, 1340?; d. ?1407. He composed more than one thousand short poems of a moral, patriotic, or historical nature, and also *Le Miroir de Mariage*, a satire on women in 13,000 lines. Other writings included *L'Art de dictier et de fere chansons, balades, virelais, et rondeaux*, a work on the art of poetizing. His works were edited by Queux de Saint-Hilaire in 10 volumes (1878-1901).

DESCHANEL, dā-shā-něl', Émile Auguste Étienne Martin, French critic and author: b. Paris, 1819; d. 1904. He was educated in Paris, where he became professor of rhetoric at the Normal School. At this period he also wrote literary and other criticism for the *Revue des Deux Mondes*, but these essays became extremely critical of the administration of Louis Napoleon, and after the coup d'état of 1851 he was arrested and expelled from France. He took up residence in Belgium, where he continued his literary work and became acquainted with Victor Hugo. Permitted to return to Paris in 1859, he became an editor of the *Journal des Débats*. In 1881 he was appointed professor of modern literature at the Collège de France, and the same year he was elected senator. His many works of literary criticism included *Histoire de la conversation* (1857); *Études sur Aristophane* (1867); *Le romantisme des classiques* (1882); *Le théâtre de Voltaire* (1886).

DESCHANEL, Paul Eugène Louis, French statesman and author: b. Brussels,

Feb. 13, 1856; d. Paris, April 28, 1922. At the time of his birth his father was a political exile. He was educated at the Collège Saint-Barbe and the Lycée Condorcet. In 1878 he became subprefect of Dreux, and was secretary-general of Seine-et-Marne and subprefect of Brest in 1879. He entered the Chamber of Deputies in 1885 as member for Eure-et-Loir, became vice-president of the Chamber in 1896, and president 1898-1902. He was a leader of the Progressive Republicans and a firm advocate of the separation of church and state. He was again president of the Chamber in 1912-1920. In 1899 he was made a member of the French Academy, and was a candidate for the office of president of the Republic. On Jan. 20, 1920 he was elected to this office, but ill health caused him to resign after a few months in office. His publications include *Orateurs et Hommes d'Etat* (1888); *Figures de femmes* (1889); *Figures littéraires* (1890); *Questions actuelles* (1891); *La décentralisation* (1895); *La Question sociale* (1898); *La République nouvelle* (1898); *Quatre ans de présidence* (1902); *L'idée de patrie* (1905); *Politique intérieure et étrangère* (1906); *A l'Institut* (1907); *L'organisation de la Démocratie* (1910); *Hors des frontières* (1910); *Paroles françaises* (1911); *Seignais, Madame de Sévigné* (1911); *Lamartine* (1913); *Gambetta* (1920).

DESCHUTES RIVER, Oregon, a river rising in southwestern Deschutes County. After a northeasterly course it forms part of the boundary between Wasco and Sherman counties and empties into the Columbia River. Its length is 250 miles.

DES CLOIZEAUX, dā klwā'zō, **Alfred Louis Olivier Legrand**, French mineralogist: b. Beauvais 1817; d. Paris, May 8, 1897. He devoted himself to the study of science and became an instructor in the Ecole Centrale des Arts et Manufactures, and later lectured at the Ecole Normale. In 1876 he was appointed to the chair of mineralogy at the Muséum d'Histoire Naturelle. His principal contributions to science were in the study of the optical properties of crystals, on which he based his crystallographic system. His discoveries include microlite, a triclinic potash feldspar and the circular polarization of cinnabar. On the subject of crystallography he wrote *Leçons de cristallographie* (1861); *Manuel de minéralogie*, 2 vols., (1862-1893); *Nouvelles recherches sur les propriétés optiques des cristaux* (1867). He was elected a member of the Academy of Sciences in 1869 and was awarded the Wollaston medal by the Geological Society of London (1886).

DESCLOT, dās-klōt', **Bernat**, a Spanish historian who flourished in the latter half of the 13th century. He is known chiefly as the author of a Catalan history of great linguistic value. Originally published under the title *Libre del rey En Pere*, it is the oldest narra-

tive of importance in the Catalan language. A Castilian translation was made by Rafael Cervera (Barcelona 1616) and an edition appeared in Madrid in 1793. The first modern edition was made by Buchon under the title *Chroniques étrangères relatives aux expéditions françaises pendant le XIII^e siècle* (Paris 1840).

DESCROIZILLES, dā-krwā-zēl', **François Antoine Henri**, French chemist: b. Dieppe, c.1745; d. Paris, April 14, 1825. He studied chemistry at Paris under Rouelle, and later became professor at Rouen. He devoted himself to the technical applications of the science. Claude Louis Berthollet (q.v.) had just discovered bleaching by chlorine, when Descroizilles tried it with success at his works at Lescure-lez-Rouen. He collected the chlorine in water containing chalk, and thus made a step, at a very early period, in the direction of bleaching-powder. In the course of his operations he contrived different pieces of apparatus for the rapid valuation of commercial products. His alkalimeter for the estimation of alkalis by Vauquelin's method, his apparatus for estimating vinegar (acetimeter), and for bleaching liquid (Bertholimeter), are among the earliest contributions to volumetric analysis. He invented a still for the estimation of alcohol in wine and was the first to show that alum is a double salt. He published a great many treatises, especially on technical chemistry, one of considerable value on a simple method of conserving stored grains.

DESDEMONA, the heroine of Shakespeare's tragedy *Othello*. She is the daughter of a Venetian senator, Brabantio, and is drawn to love the Moor who visits her father, by hearing him relate the vicissitudes of his adventurous career. She marries him against her father's will and proves a devoted wife, but Othello, through the machinations of Iago, is led to doubt her fidelity, and, in a jealous rage, smothers her. Desdemona's character is marked by modesty, sweetness and innocent trustfulness. See *OTHELLO*.

DESERET, State of (from *deseret*, Book of Mormon, signifying "land of the honeybee"), the name given to the State of Utah, March 4, 1849, at a convention of Mormons in Salt Lake City, when they adopted a constitution establishing "a free and independent government by the name of the State of Deseret." Congress refusing recognition created the Territory of Utah (q.v.) the year following.

DESERONTO, Canada, a town in Hastings County, province of Ontario, on the Bay of Quinte, at the mouth of the Napanee River and on a branch of the Canadian National Railway. It is about 132 miles east of Toronto. Its principal manufactures are electrical appliances and butter. It is an attractive summer resort and has become famous for its bass fishing. Pop. (1951 est.) 1,261.

